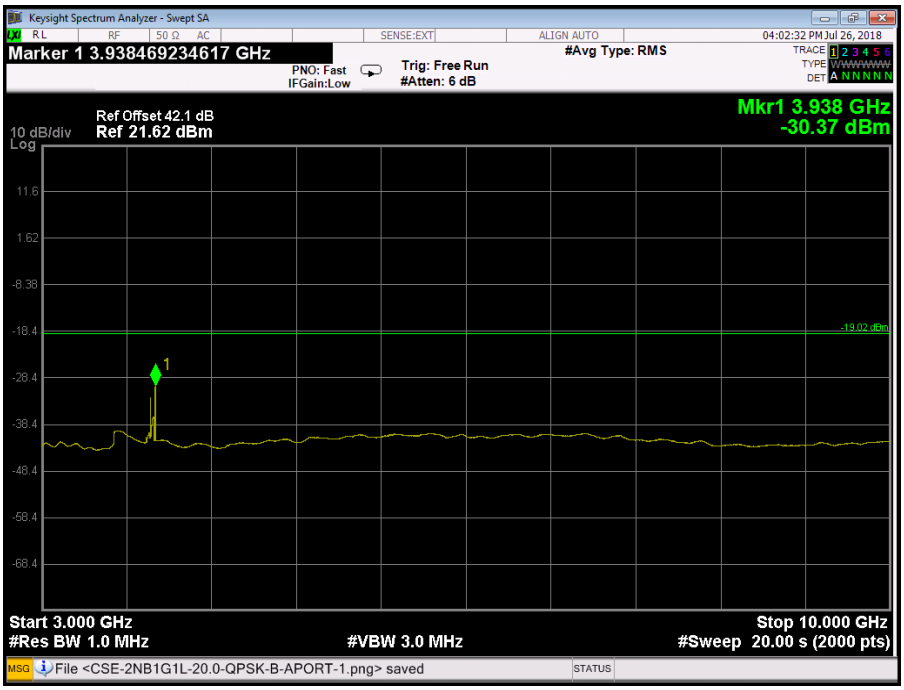

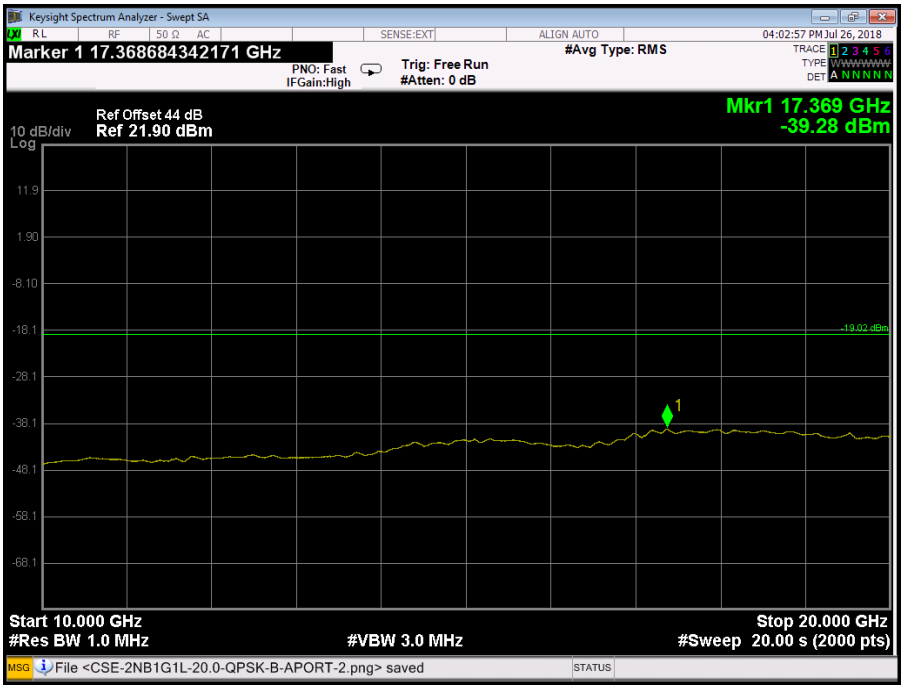

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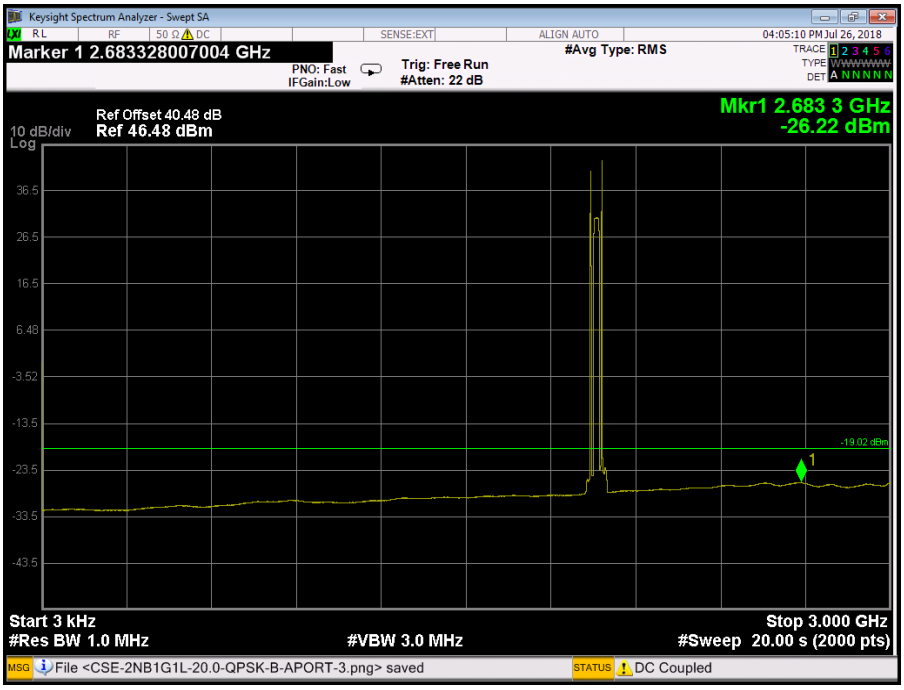
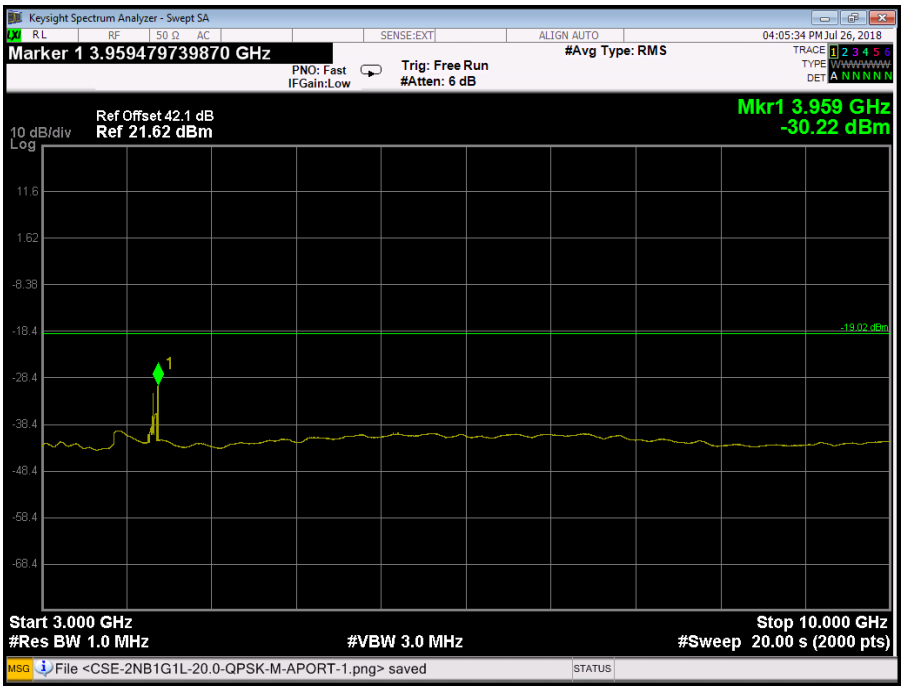
Port A, Channel Position M, LTE 20.0 MHz





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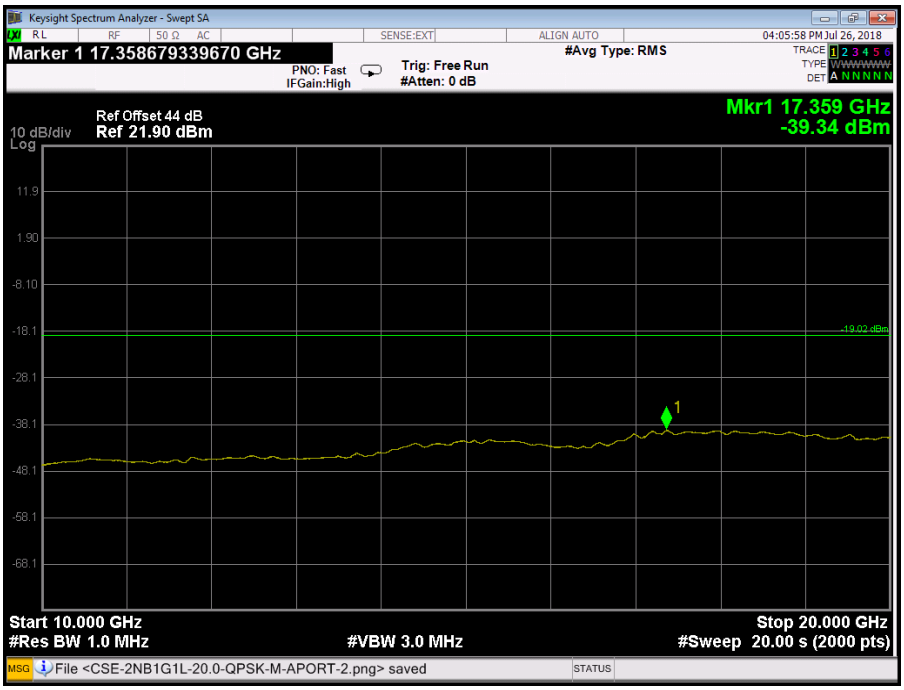
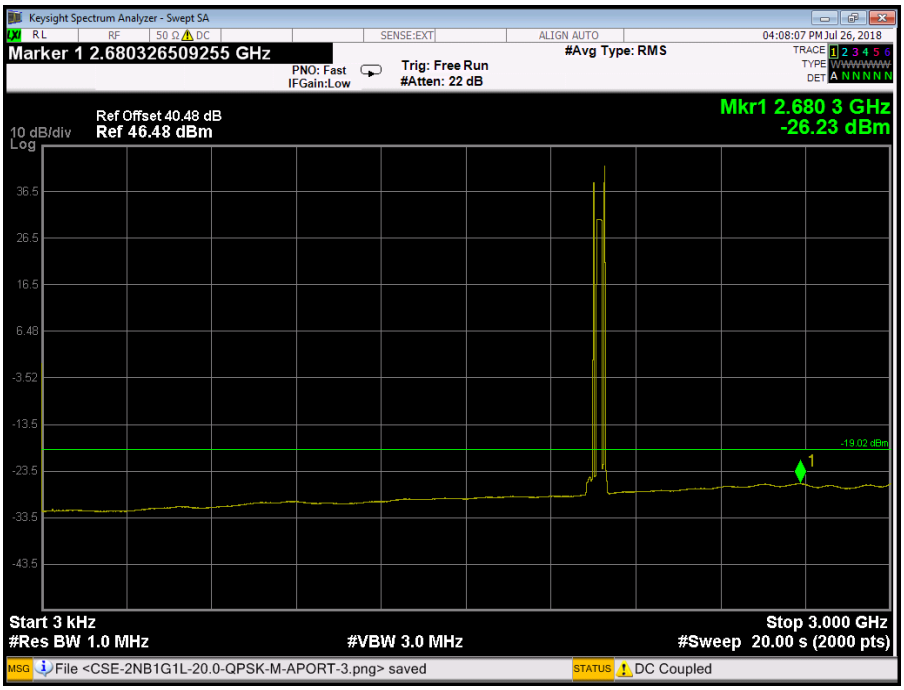


Port A, Channel Position T, LTE 20.0 MHz



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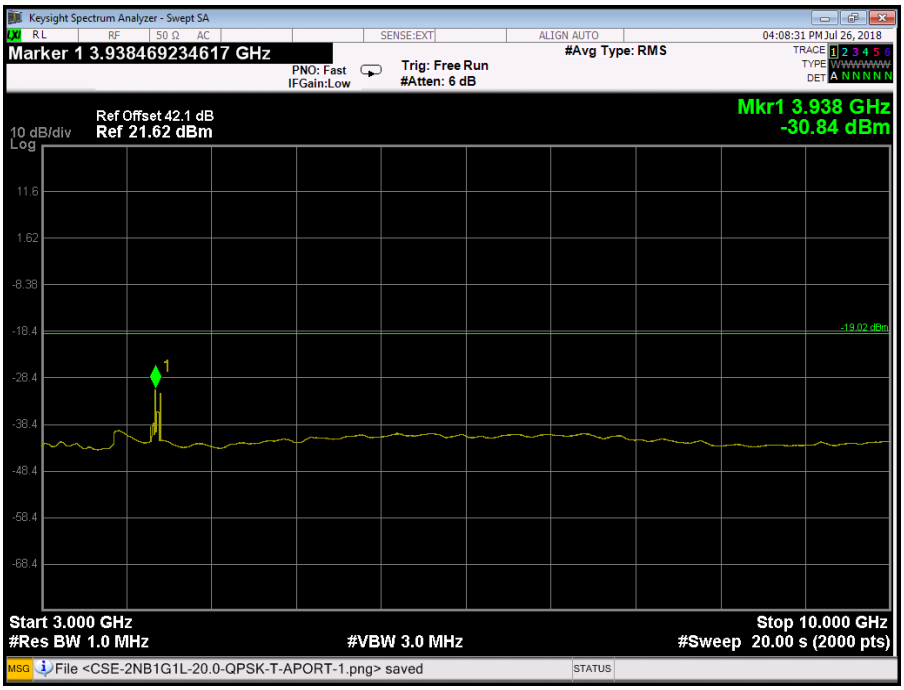

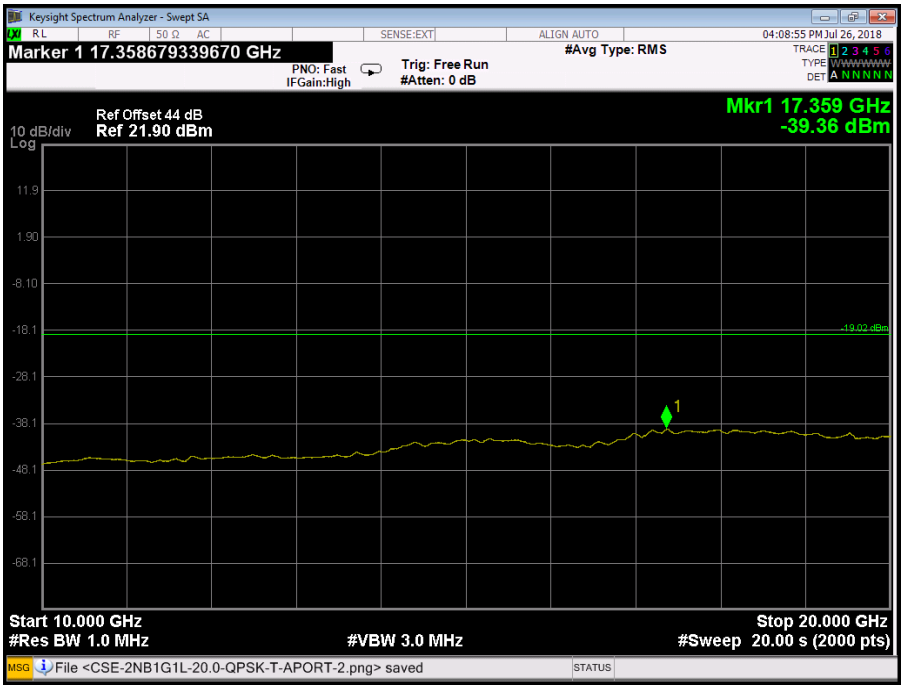

Configuration NB-IoT-IB+GSM+LTE-MIMO-MC-1(1IB QPSK +1GSM GMSK +1LTE QPSK)

Channel Bandwidth	RBW (MHz)	Limit (dBm)
IB: 5.0 MHz G: 250 KHz L:5.0 MHz	1.0	-19.02

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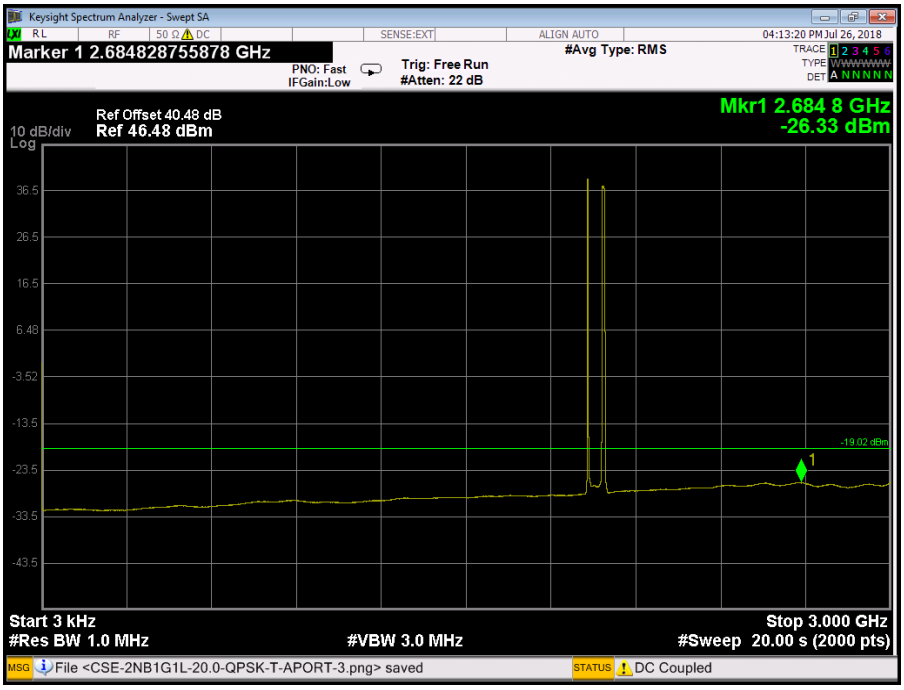
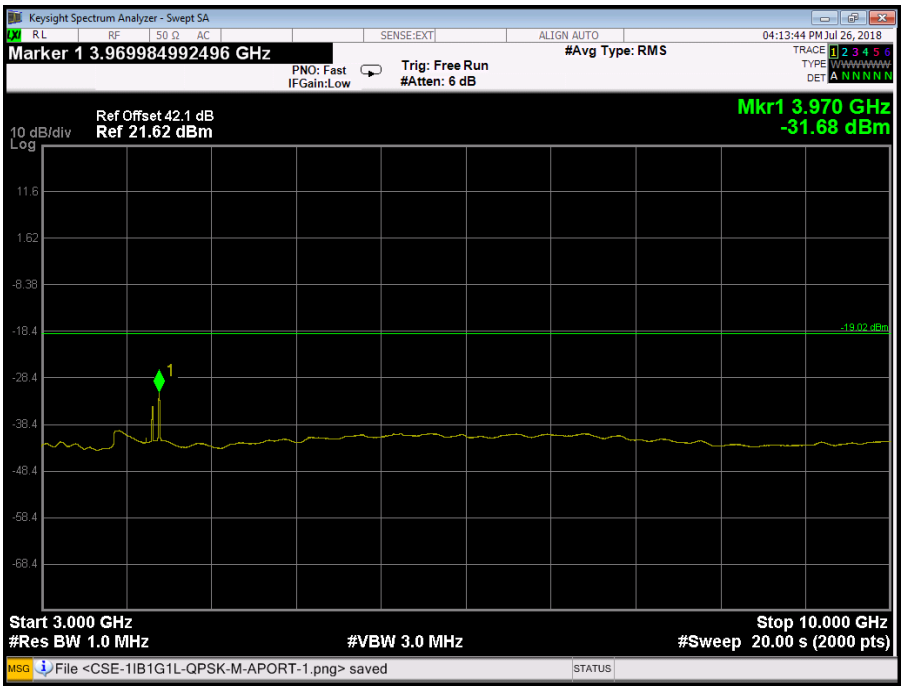
Port A, Channel Position M





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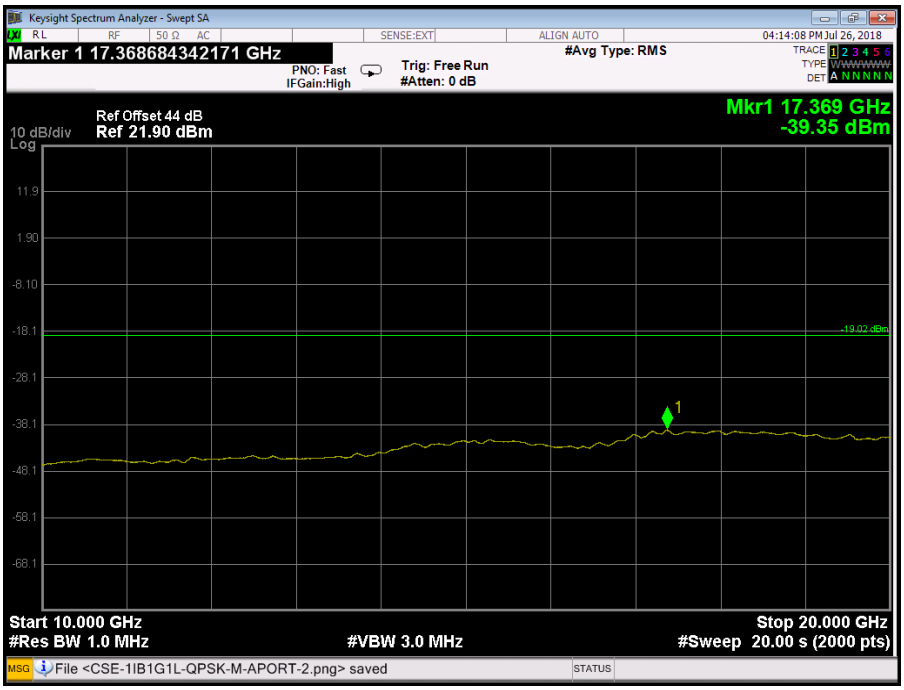
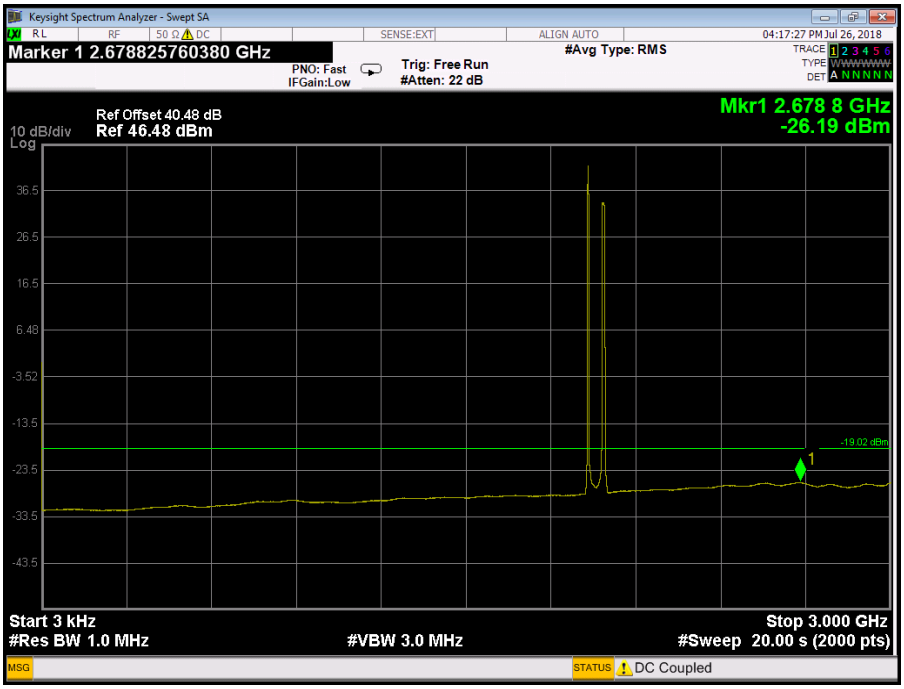


Configuration NB-IoT-IB+GSM+LTE-MIMO-MC-2(1IB QPSK +4GSM GMSK +1LTE QPSK)

Channel Bandwidth	RBW (MHz)	Limit (dBm)
IB: 5.0 MHz G: 250 KHz L:5.0 MHz	1.0	-19.02

Port A, Channel Position M



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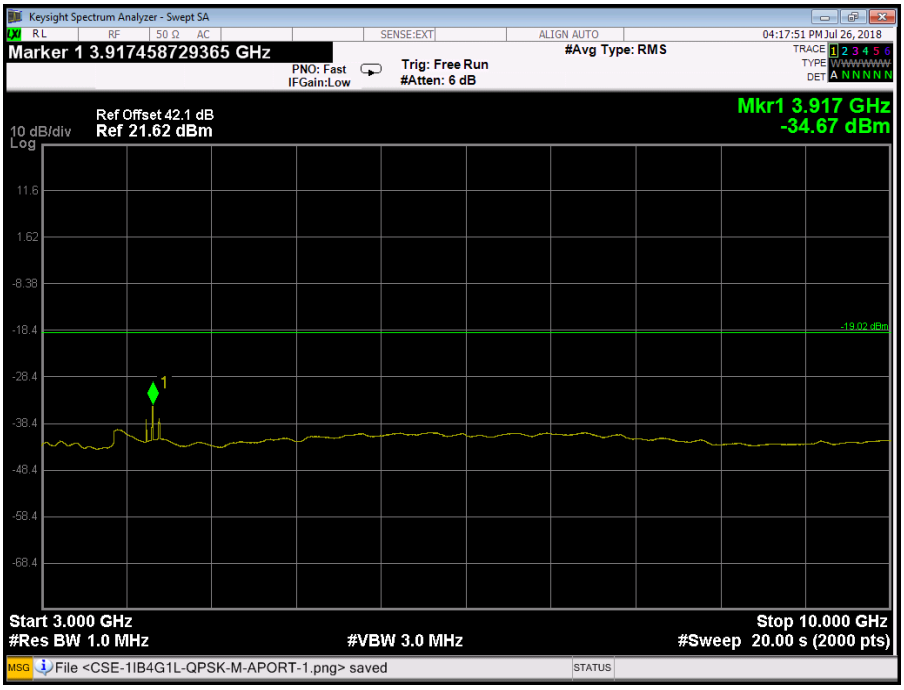

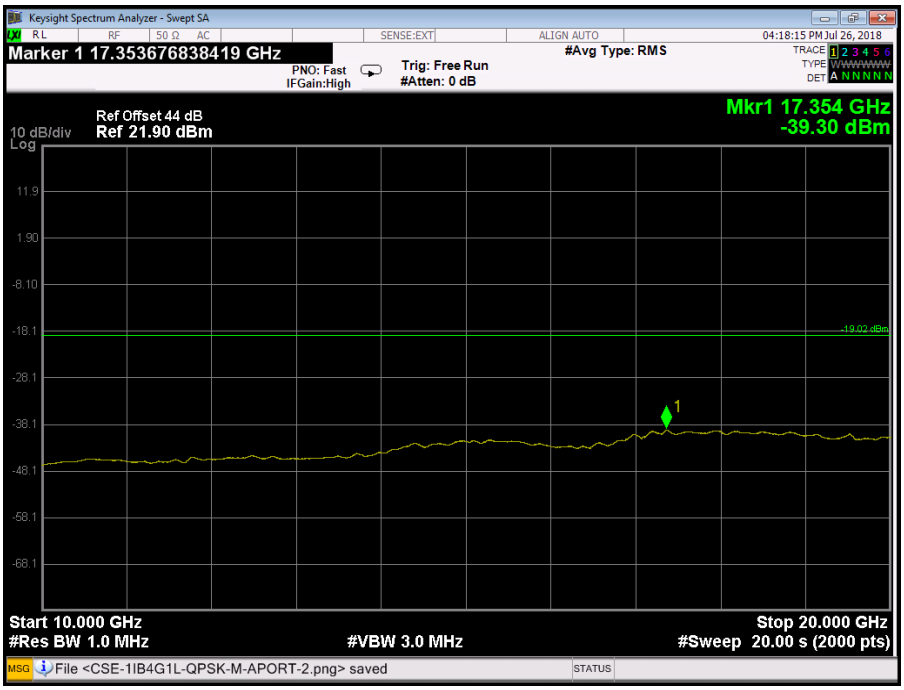

Configuration NB-IoT-GB+GSM+LTE-MIMO-MC-1(1GB QPSK +1GSM GMSK +1LTE QPSK)

Channel Bandwidth	RBW (MHz)	Limit (dBm)
GB: 10.0 MHz G: 250 KHz L:10.0 MHz	1.0	-19.02

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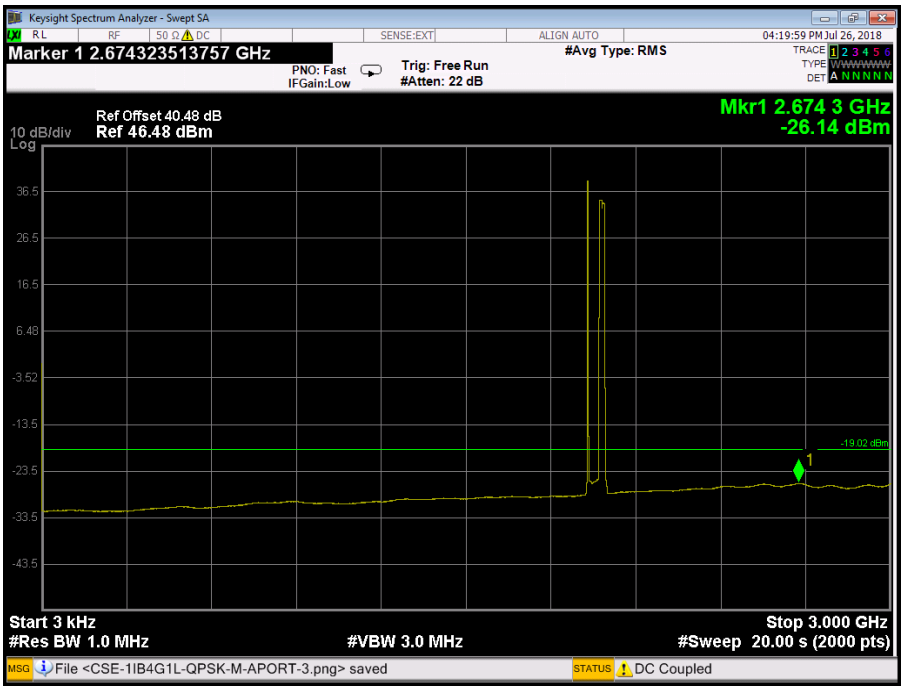
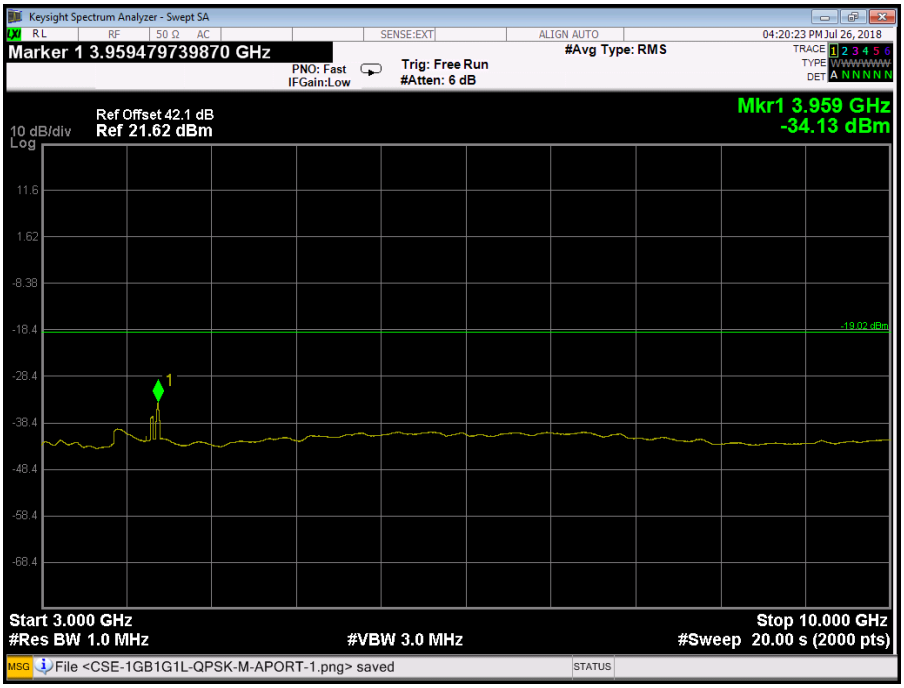
Port A, Channel Position M





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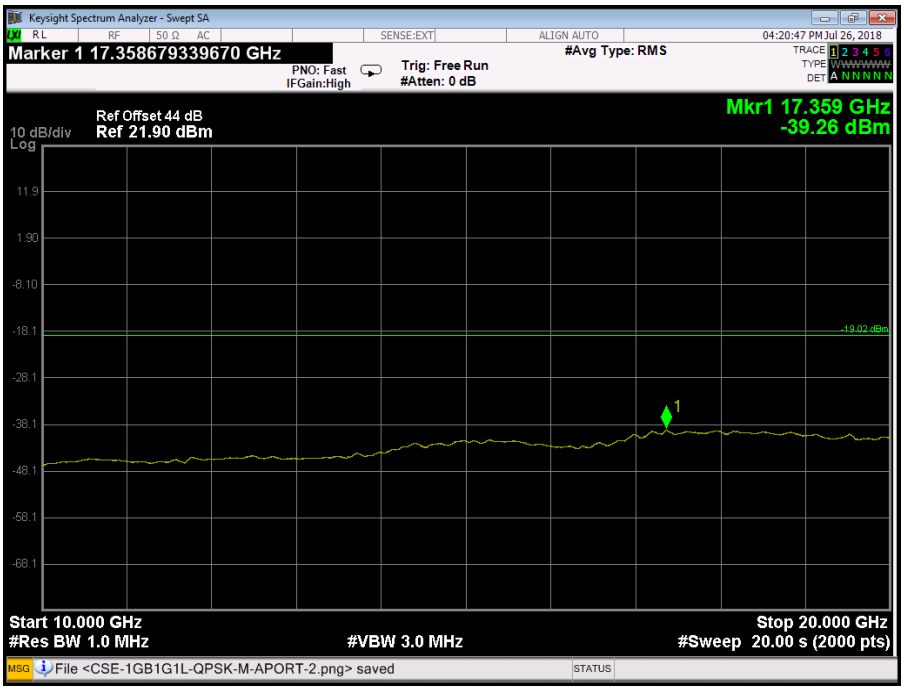
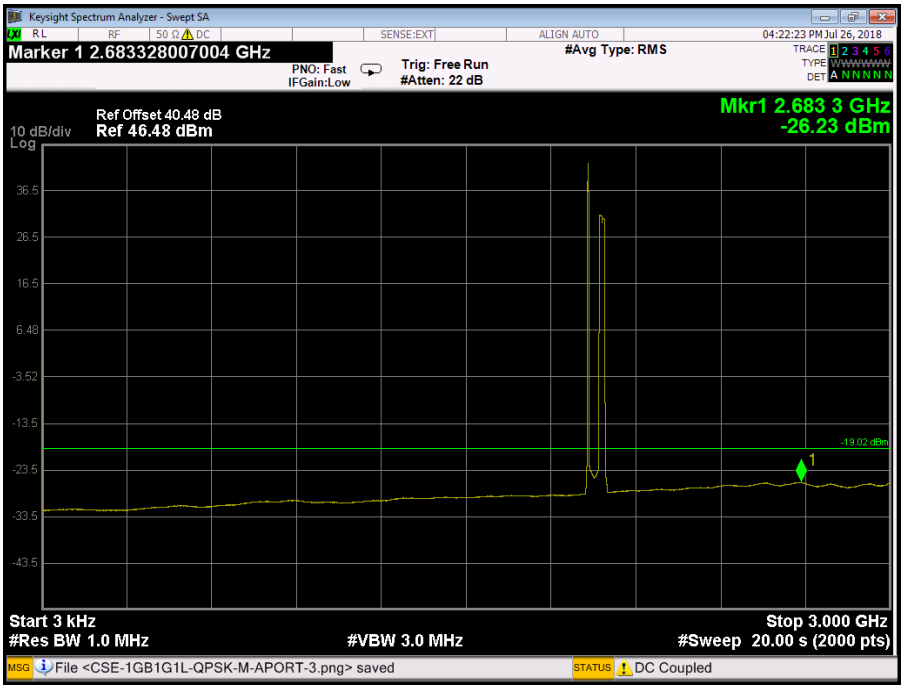


Configuration NB-IoT-GB+GSM+LTE-MIMO-MC-2(1GB QPSK +4GSM GMSK +1LTE QPSK)

Channel Bandwidth	RBW (MHz)	Limit (dBm)
GB: 10.0 MHz G: 250 KHz L:10.0 MHz	1.0	-19.02

Port A, Channel Position M



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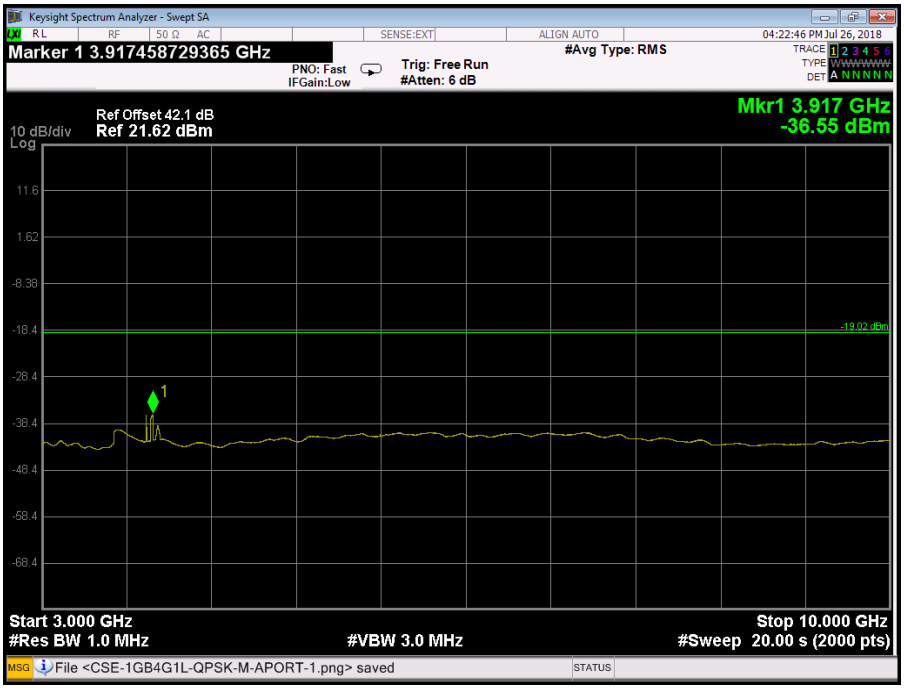

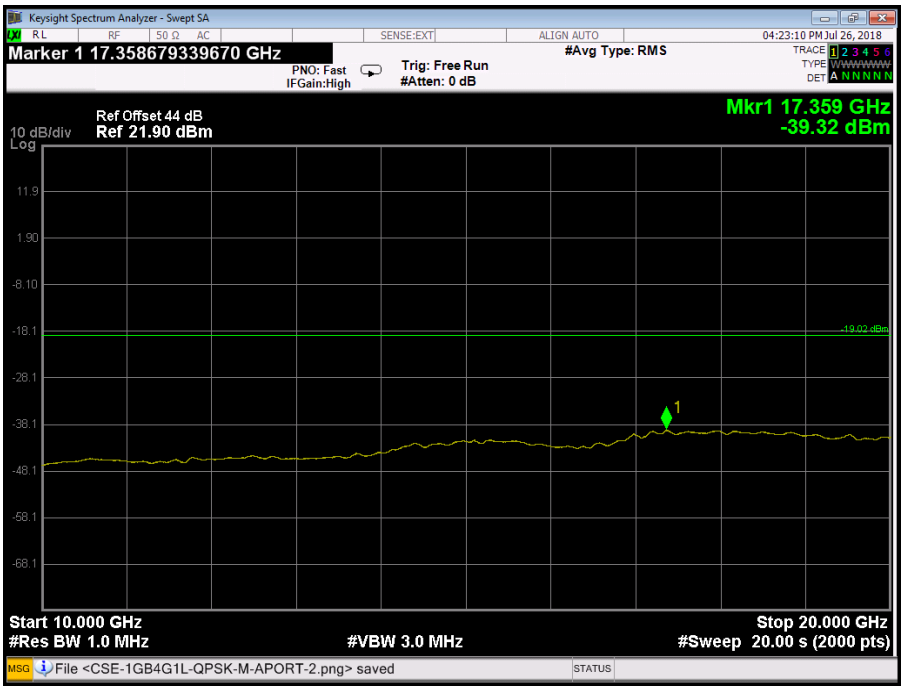

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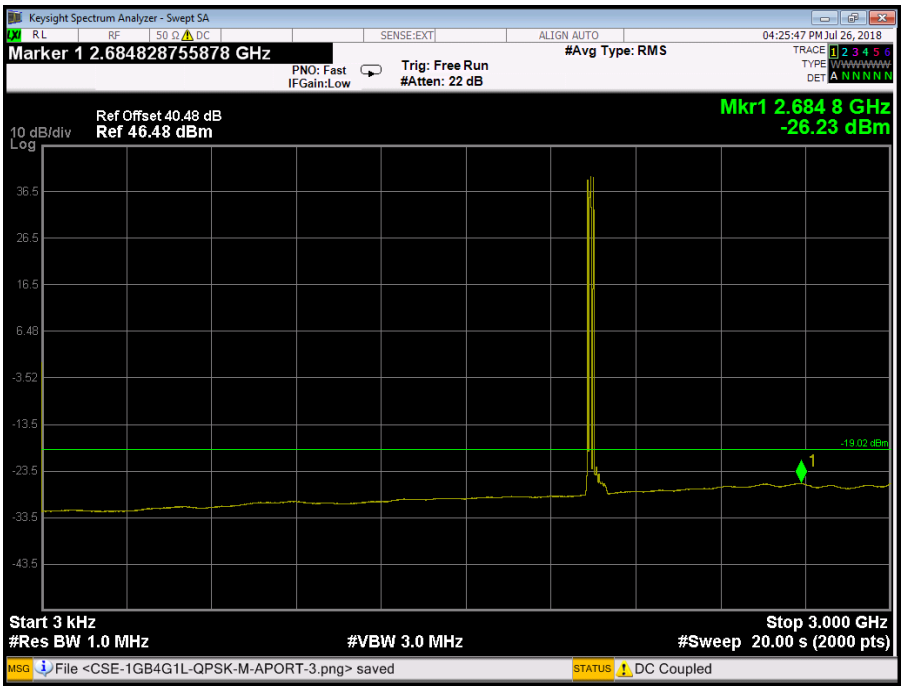
Configuration NB-IoT+WCDMA+LTE-MIMO-MC-2 (2SA QPSK +1WCDMA QPSK +1LTE QPSK)

Channel Bandwidth	RBW (MHz)	Limit (dBm)
SA: 250 KHz W: 5.0 MHz L:1.4 MHz	1.0	-19.02
SA: 250 KHz W: 5.0 MHz L:3.0 MHz	1.0	-19.02
SA: 250 KHz W: 5.0 MHz L:5.0 MHz	1.0	-19.02
SA: 250 KHz W: 5.0 MHz L:10.0 MHz	1.0	-19.02
SA: 250 KHz W: 5.0 MHz L:15.0 MHz	1.0	-19.02
SA: 250 KHz W: 5.0 MHz L:20.0 MHz	1.0	-19.02

Port A, Channel Position B, LTE 1.4 MHz



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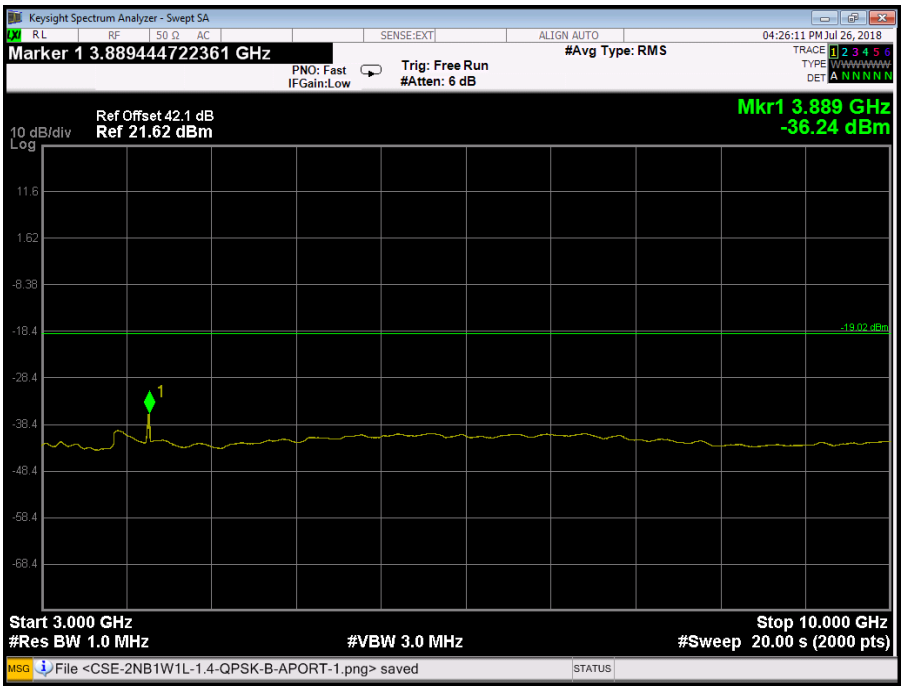

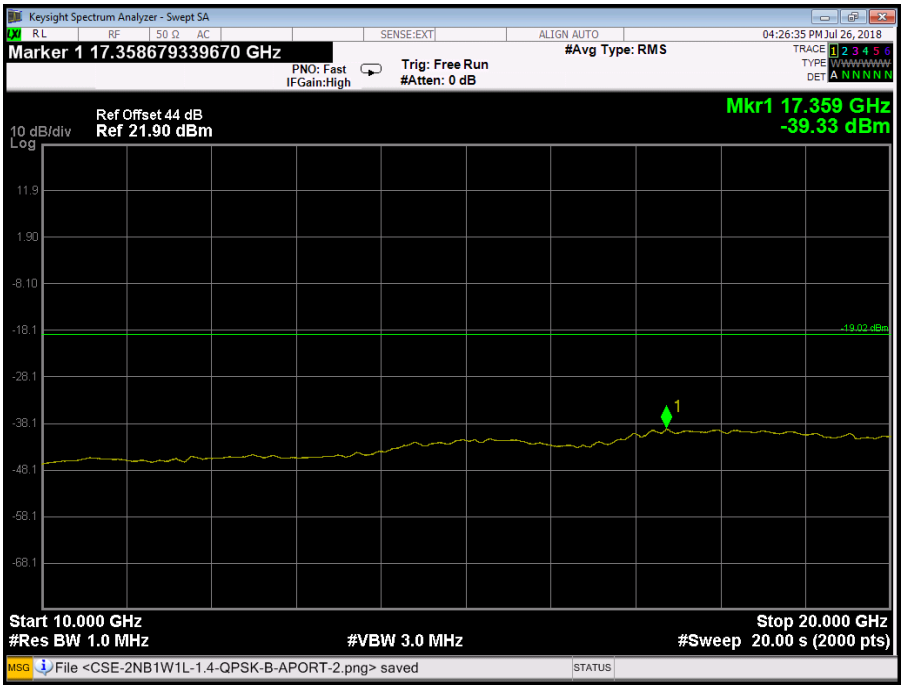

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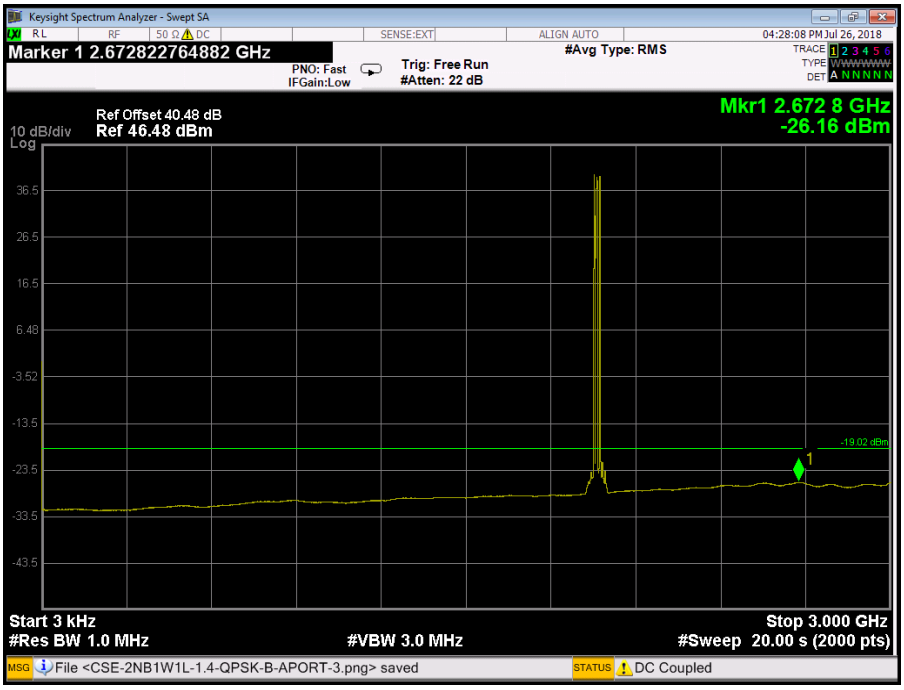
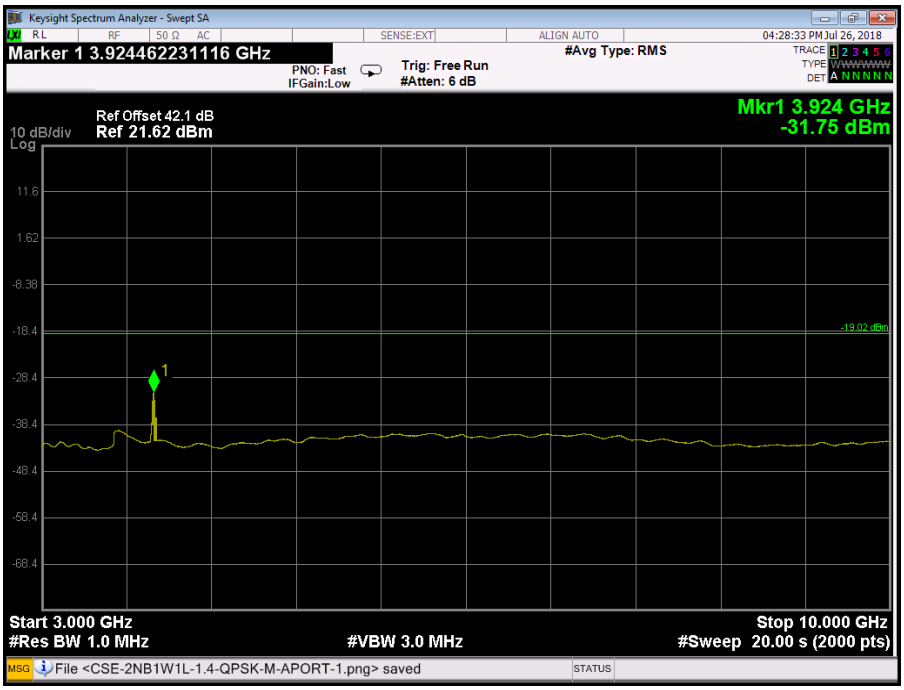
Port A, Channel Position M, LTE 1.4 MHz





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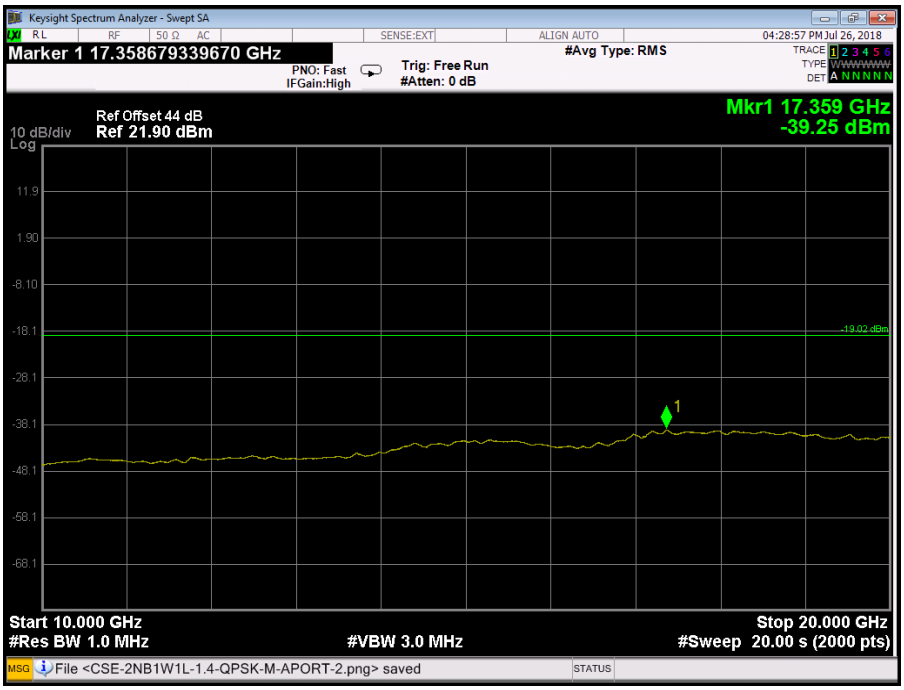
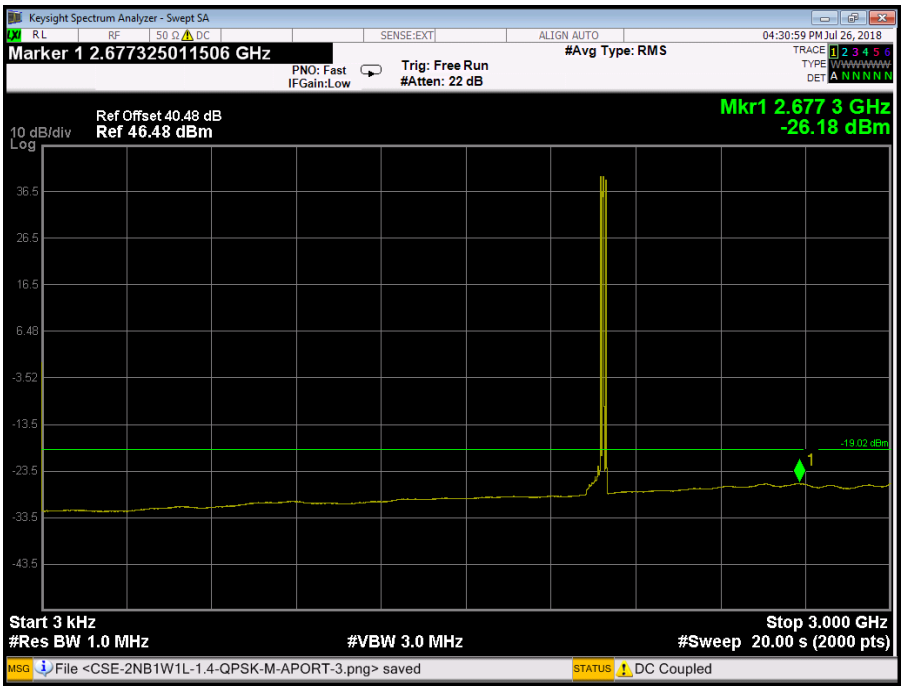


Port A, Channel Position T, LTE 1.4 MHz



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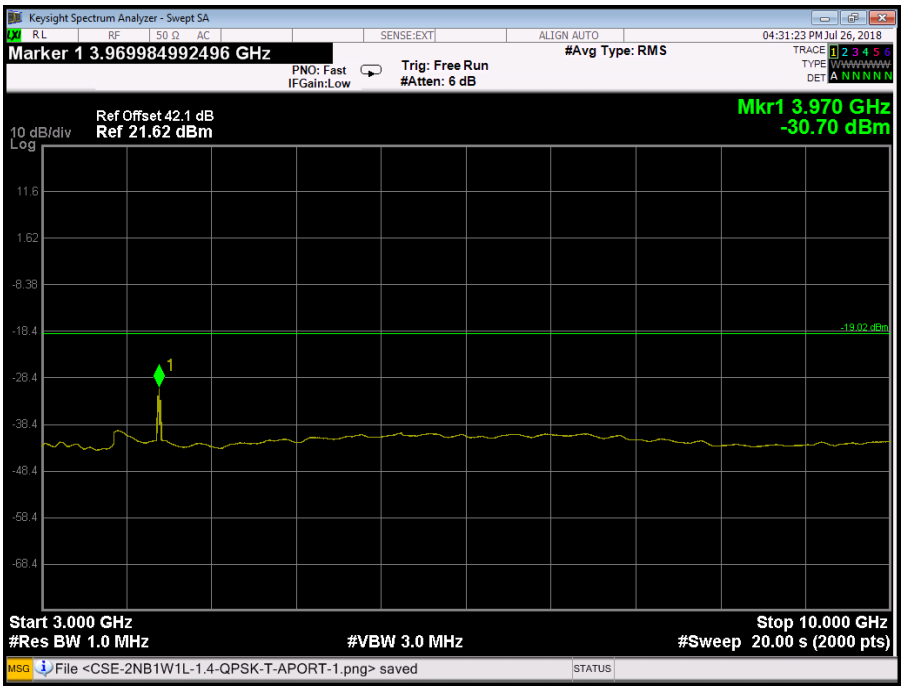

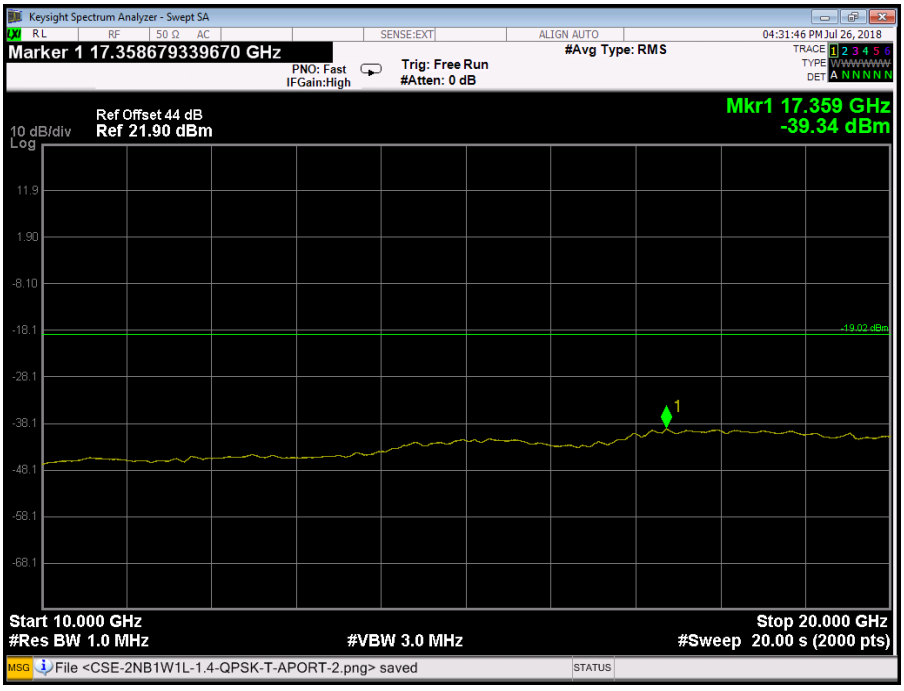

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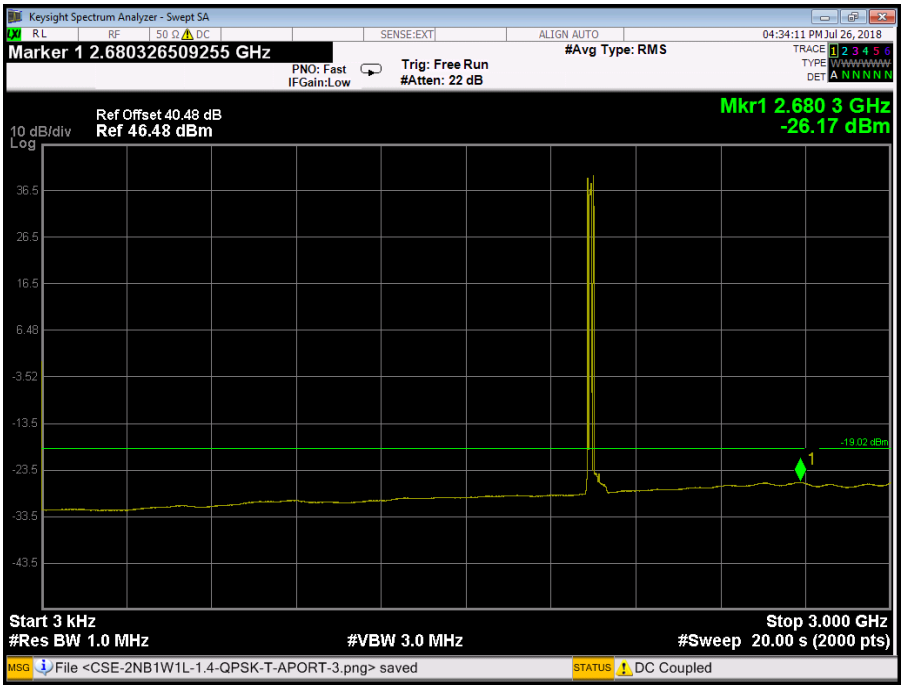
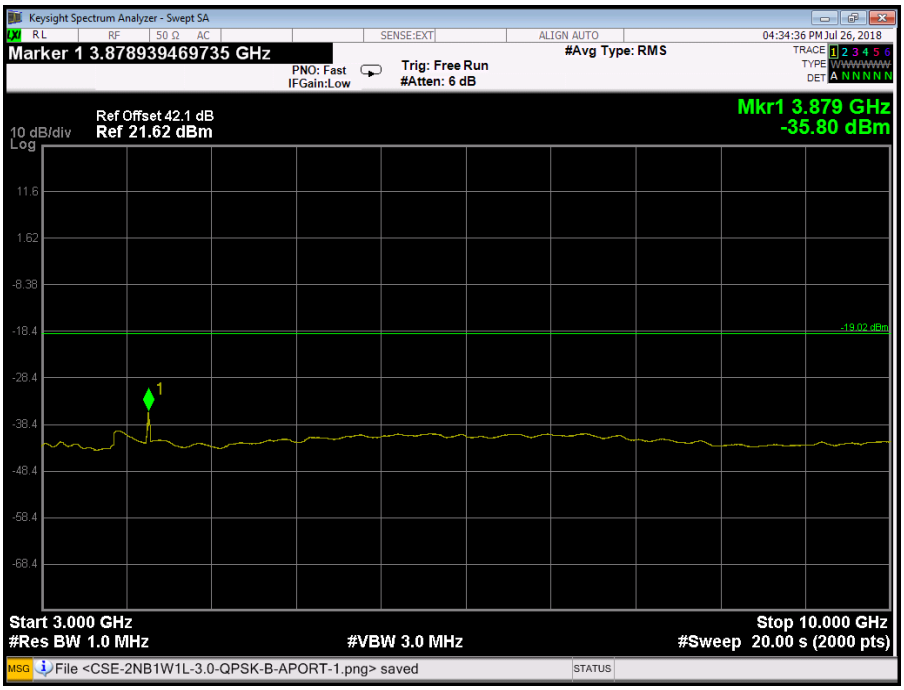
Port A, Channel Position B, LTE 3.0 MHz





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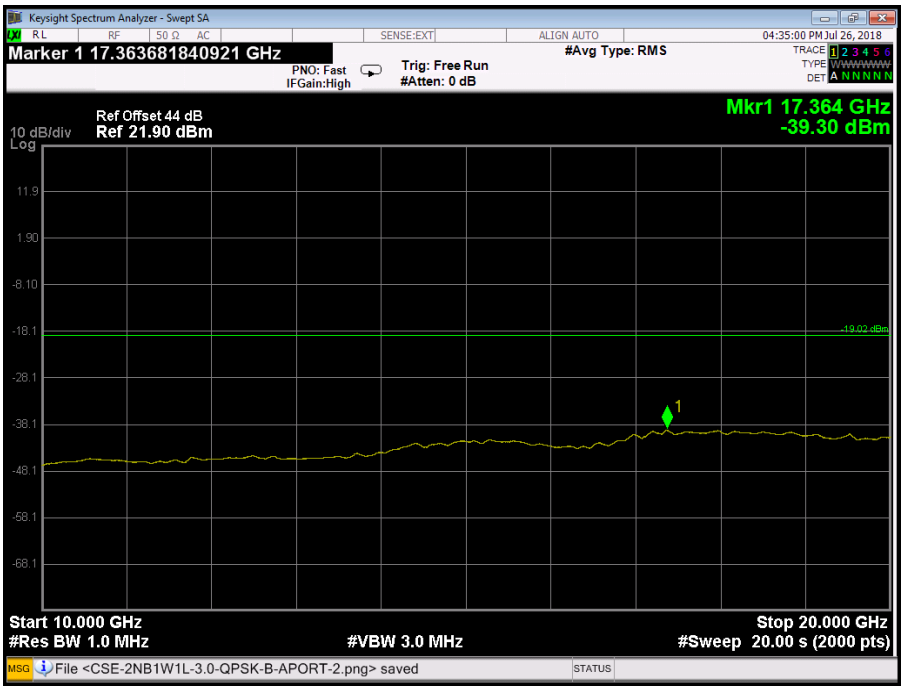
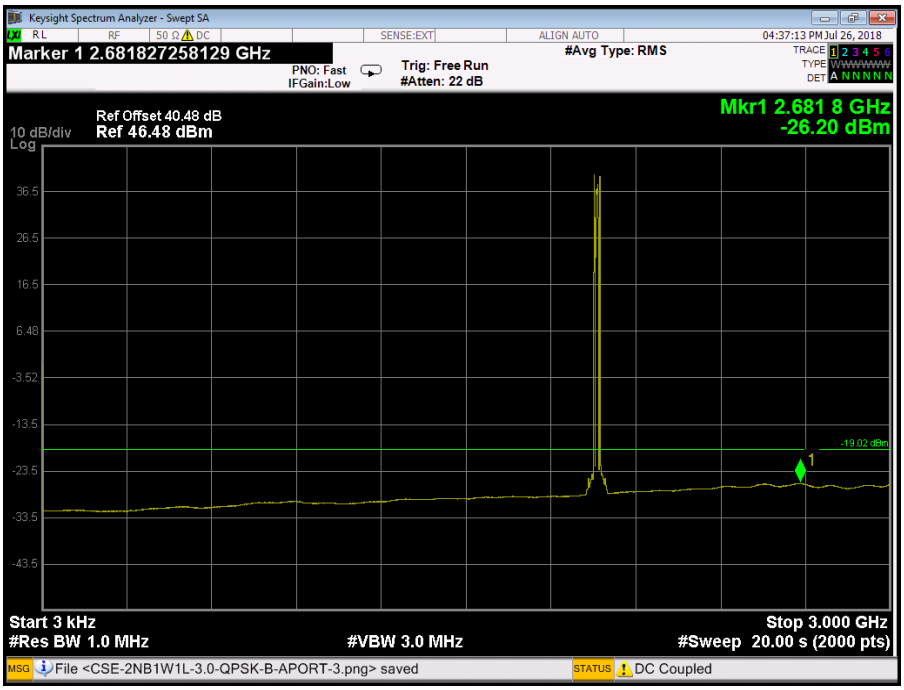


Port A, Channel Position M, LTE 3.0 MHz



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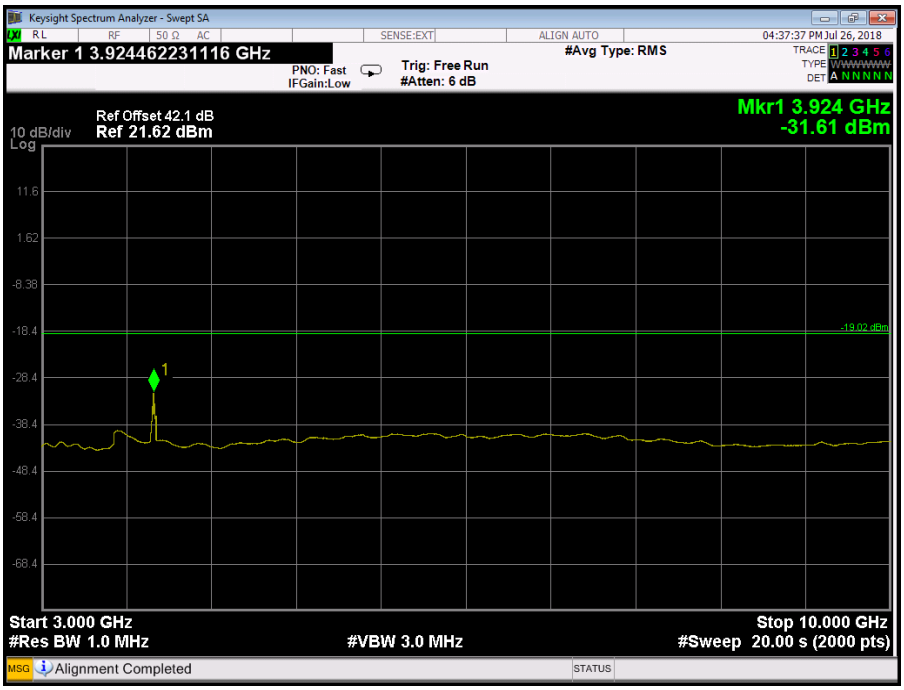

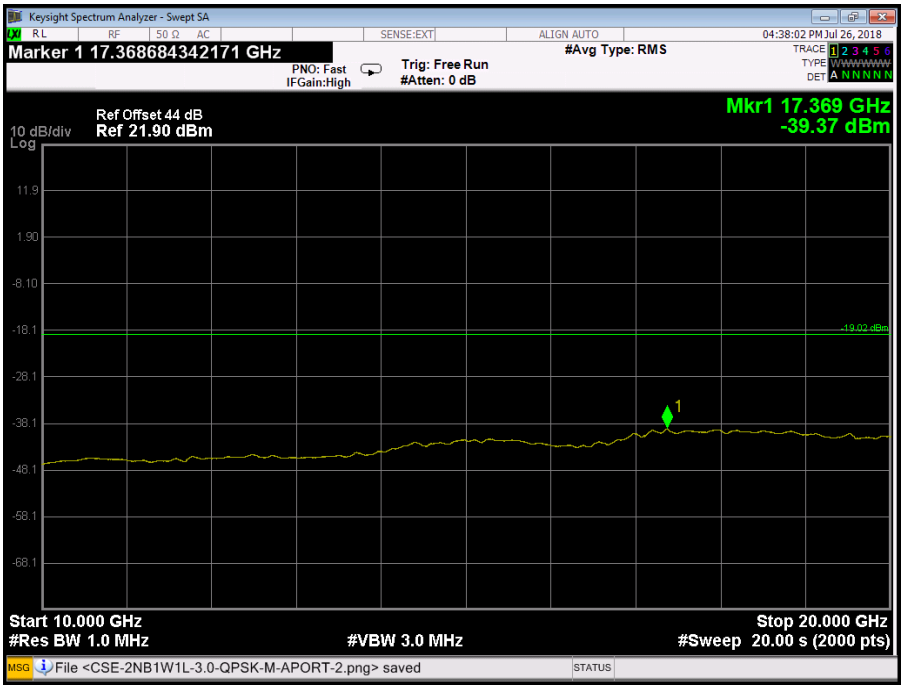

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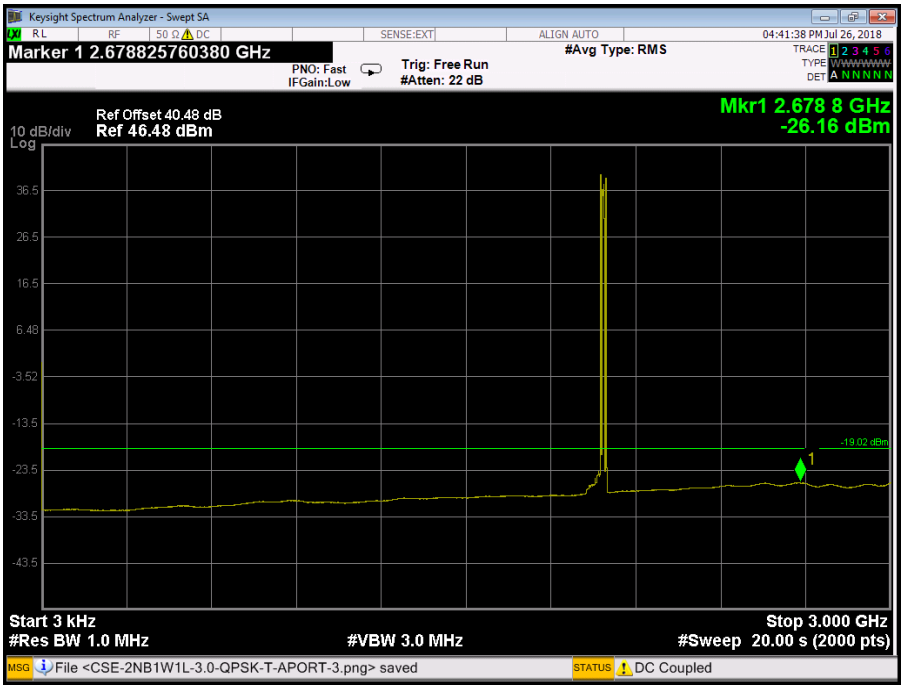
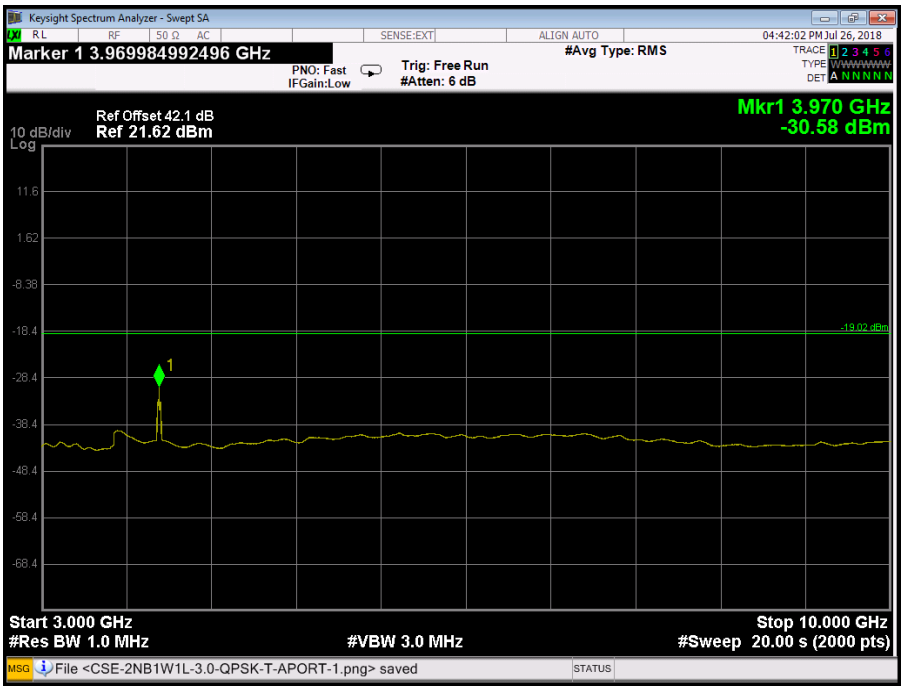
Port A, Channel Position T, LTE 3.0 MHz





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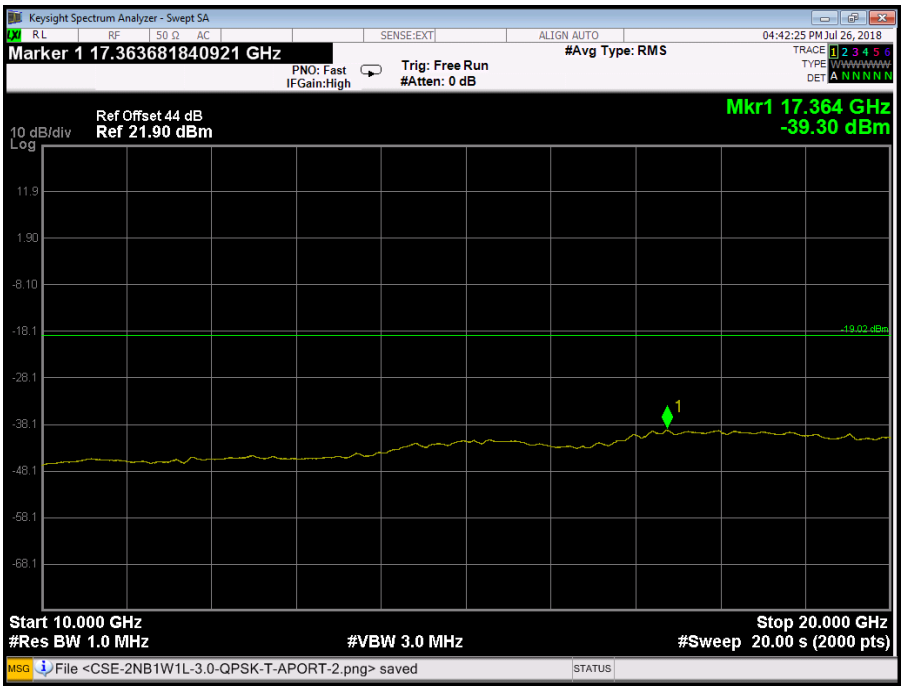
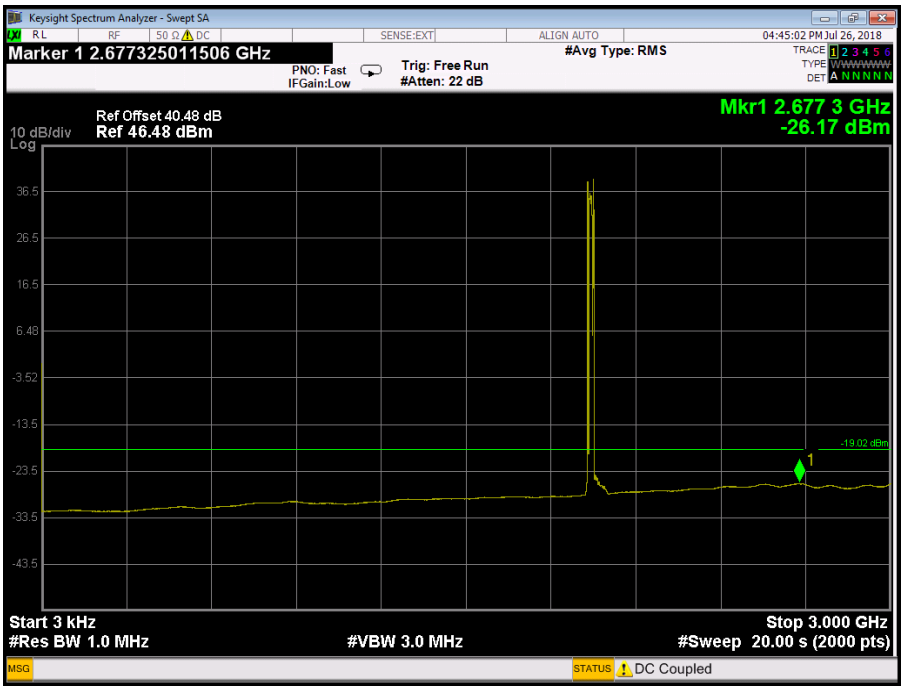


Port A, Channel Position B, LTE 5.0 MHz



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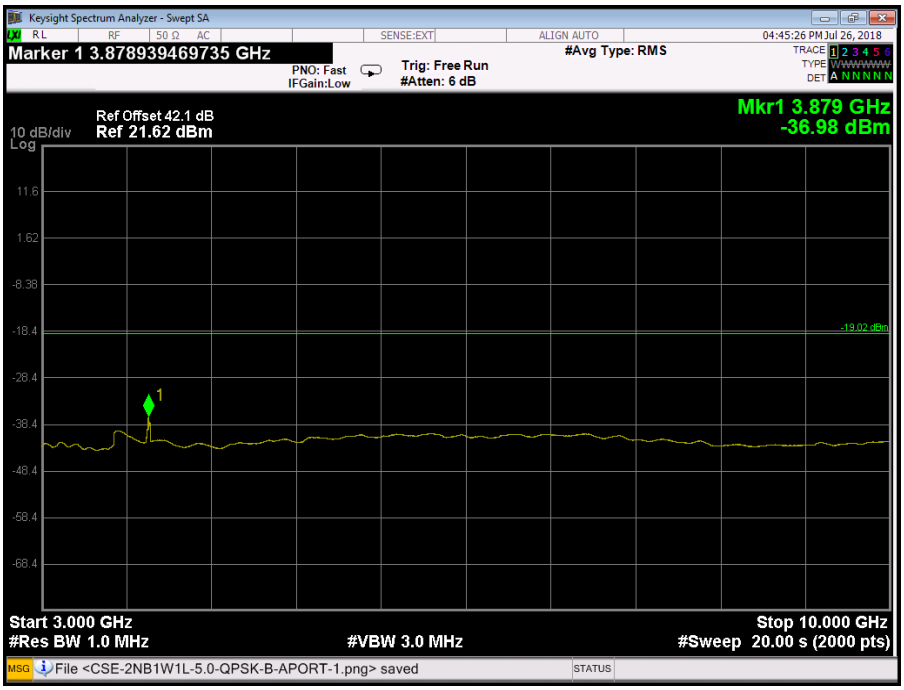

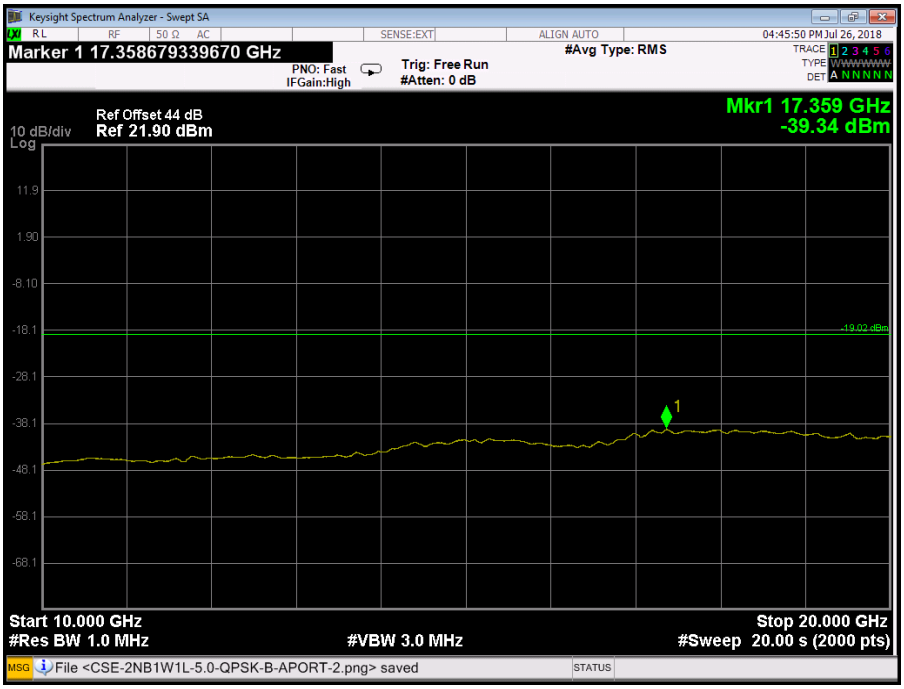

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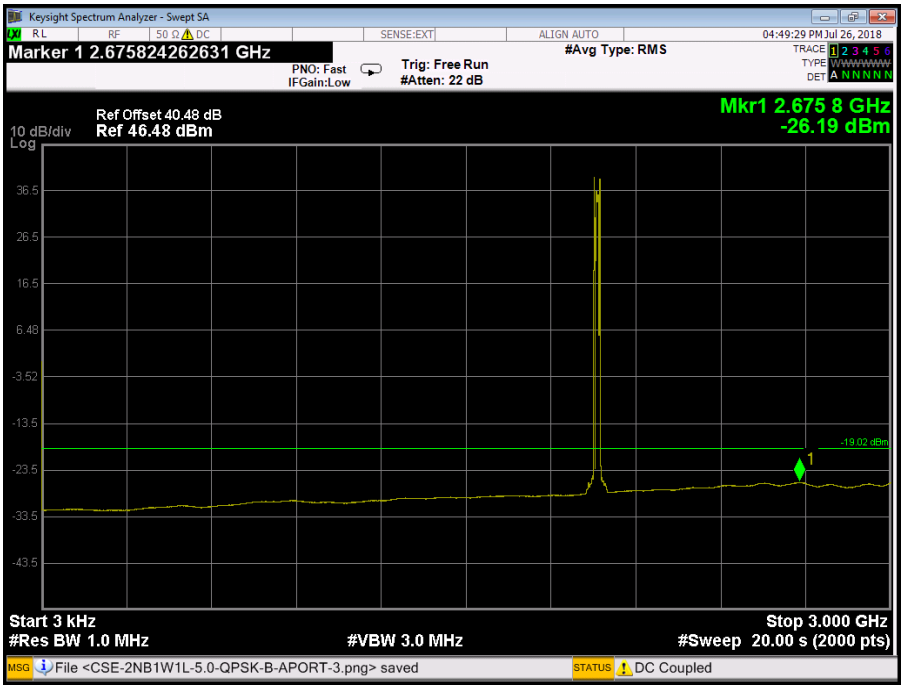
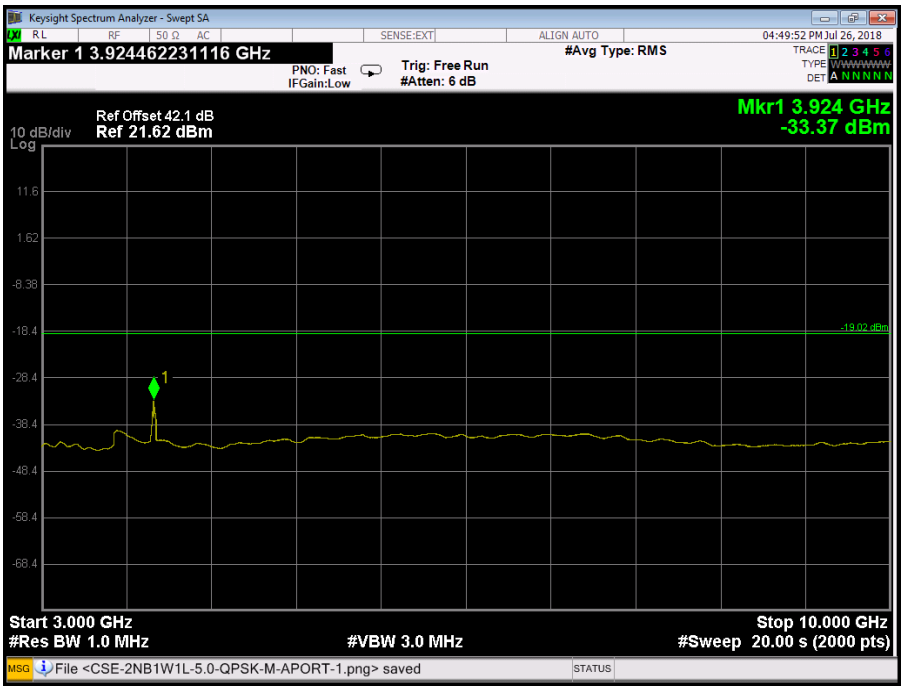
Port A, Channel Position M, LTE 5.0 MHz





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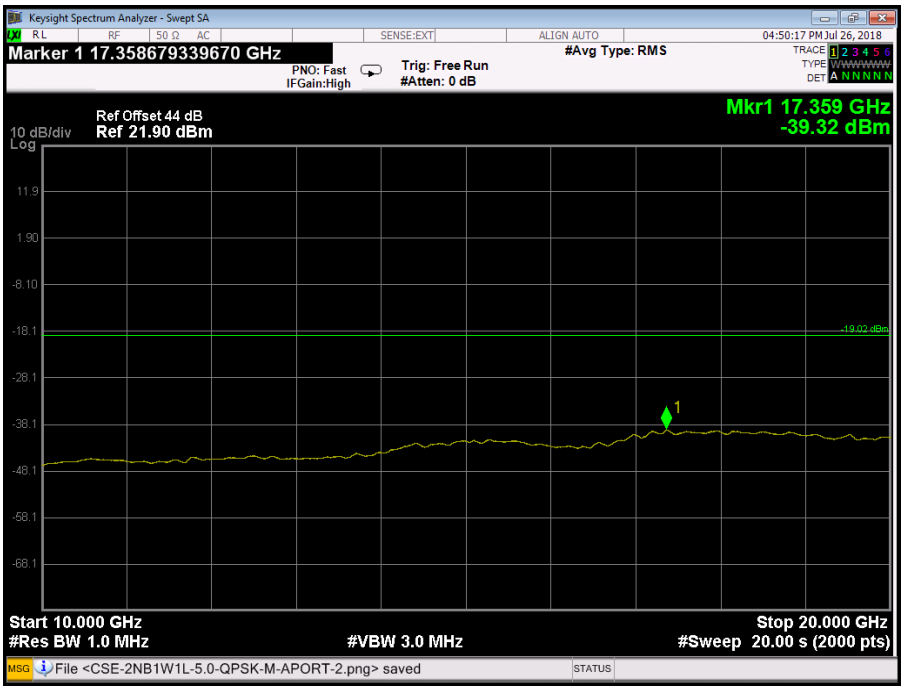
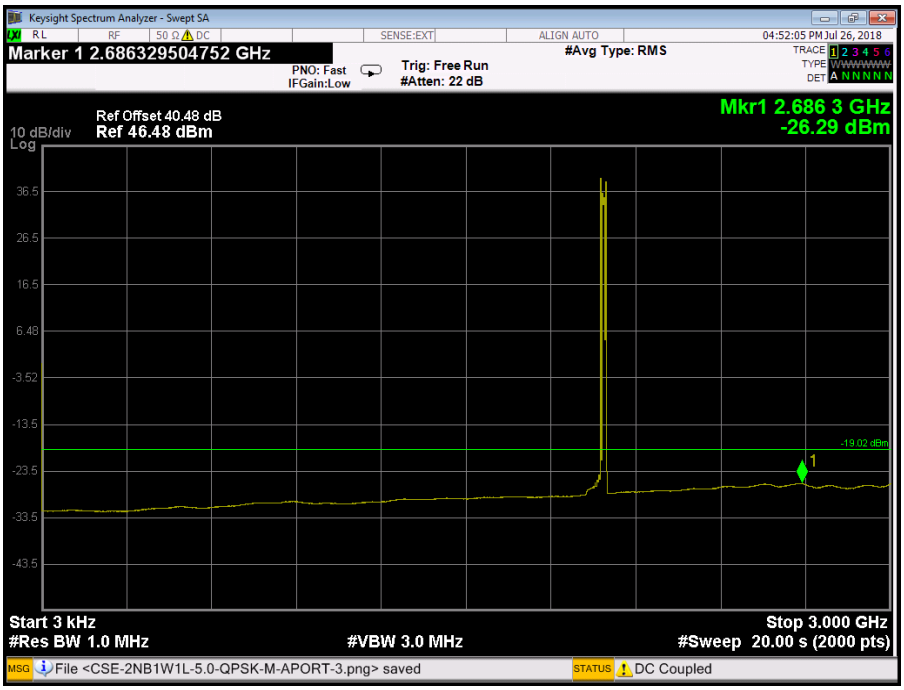


Port A, Channel Position T, LTE 5.0 MHz



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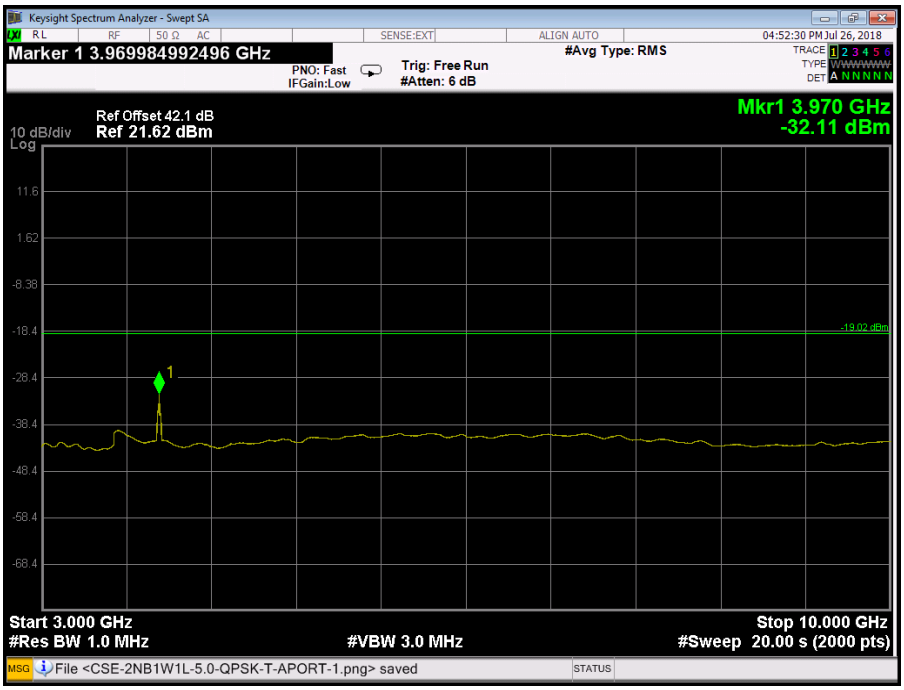

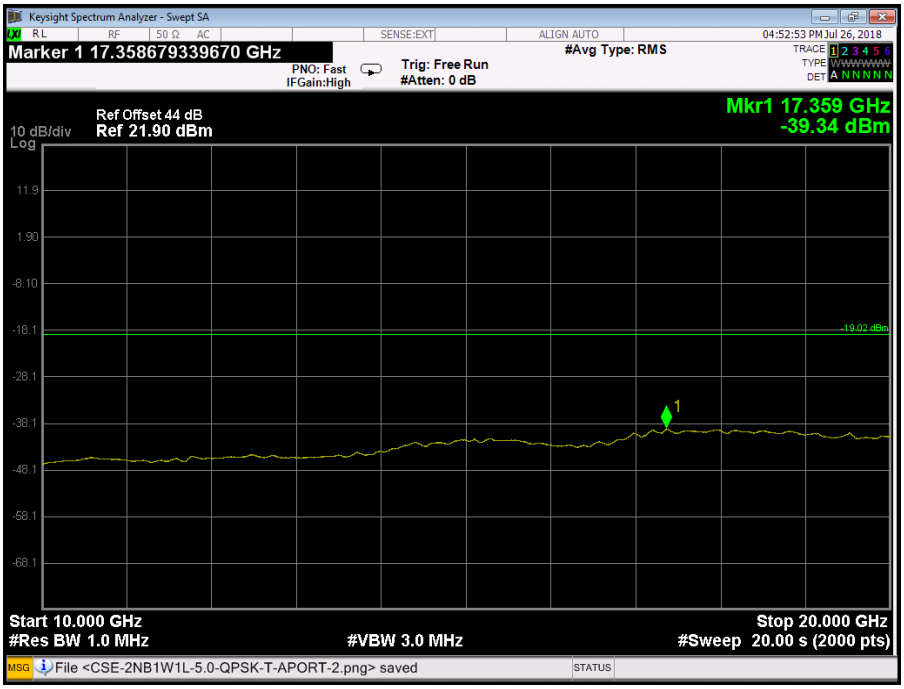

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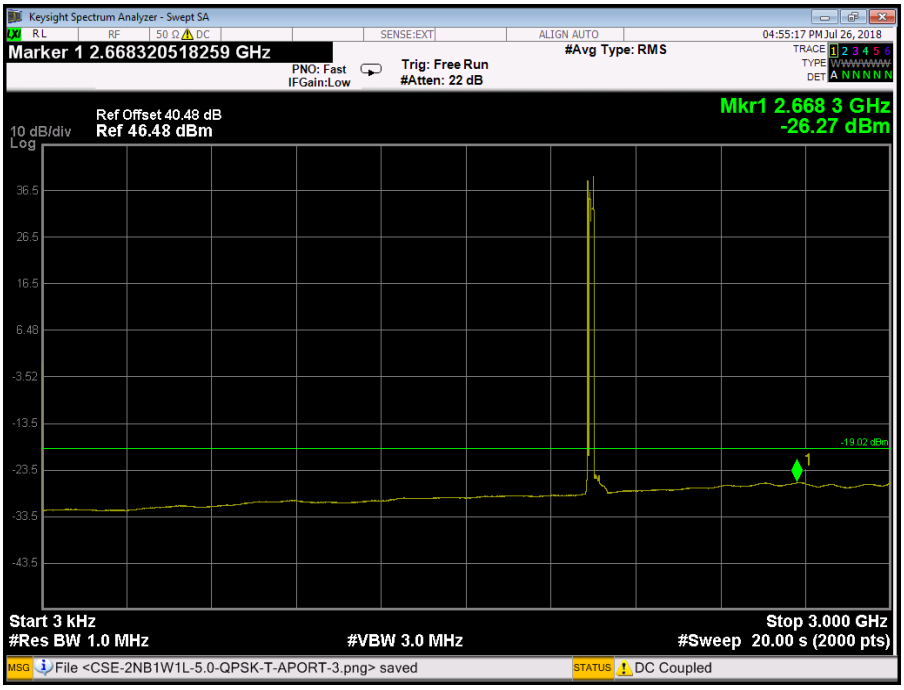
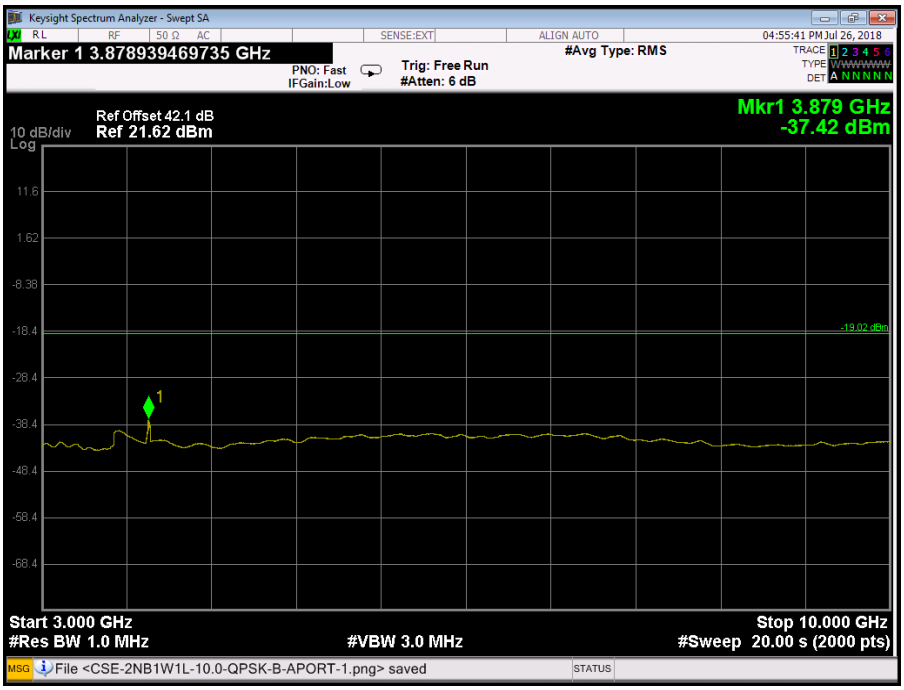
Port A, Channel Position B, LTE 10.0 MHz





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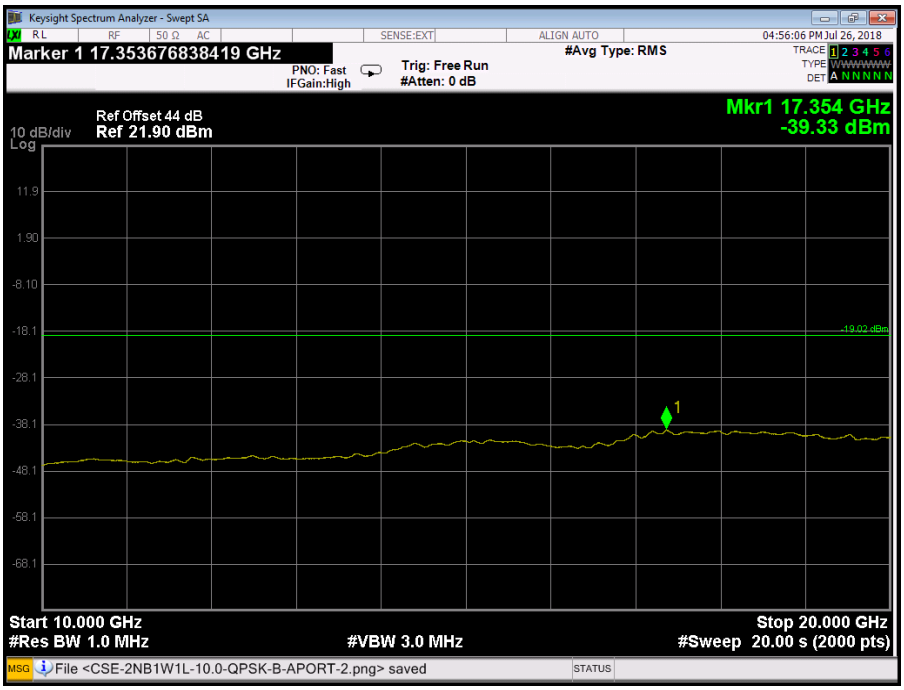
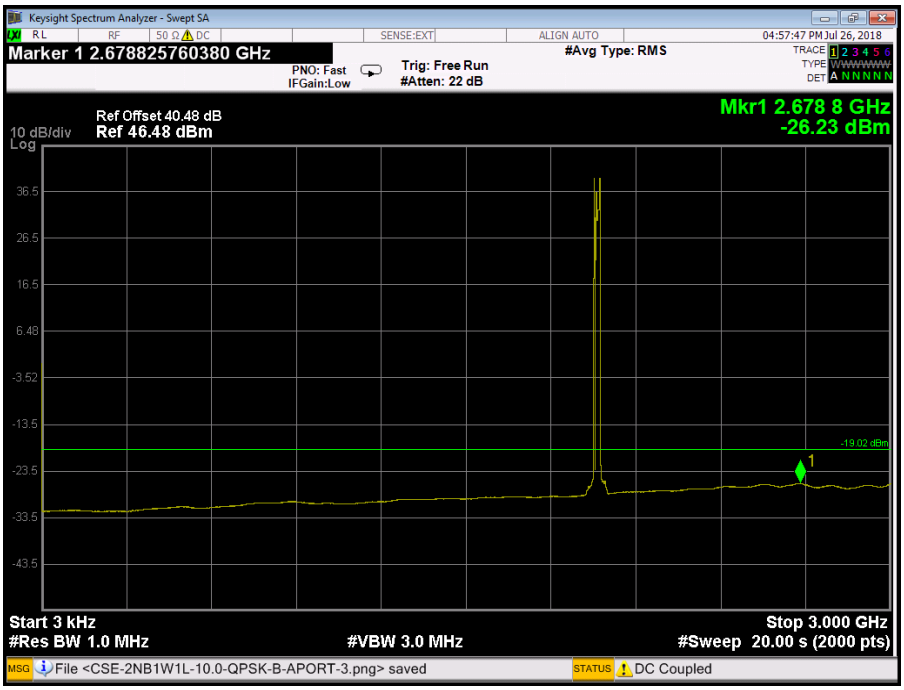


Port A, Channel Position M, LTE 10.0 MHz



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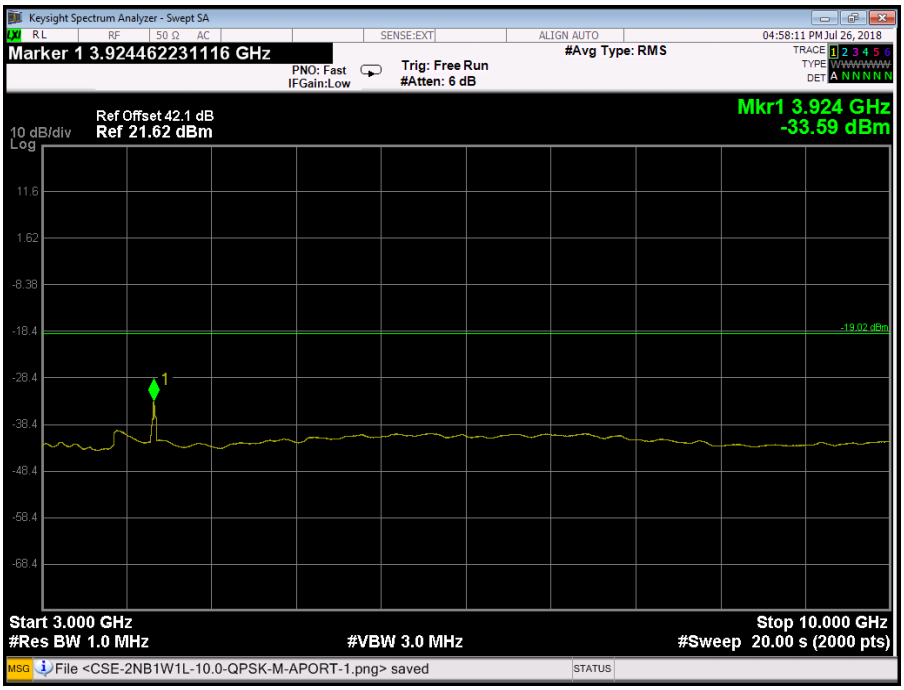

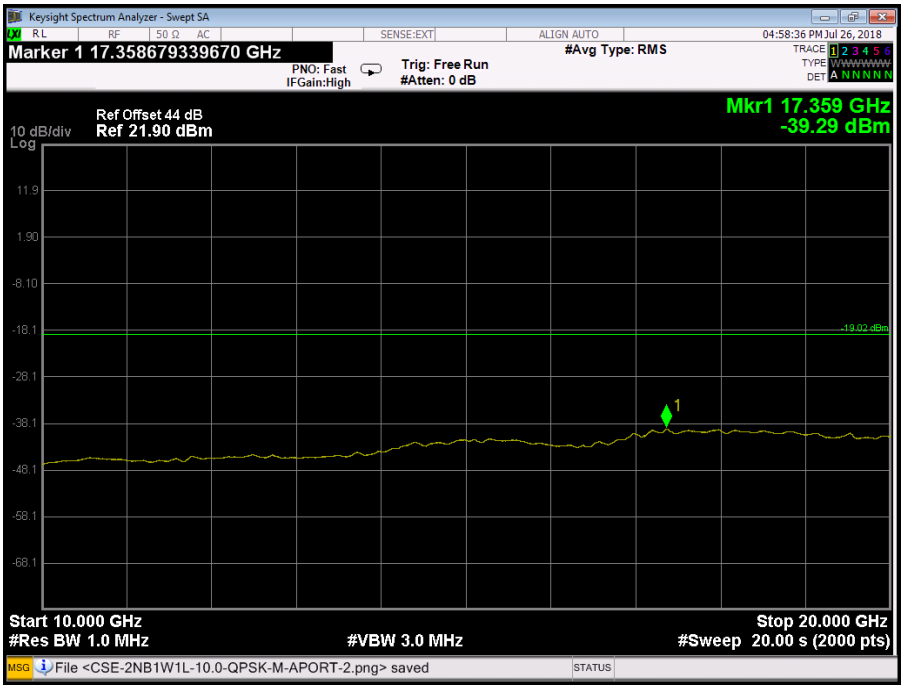

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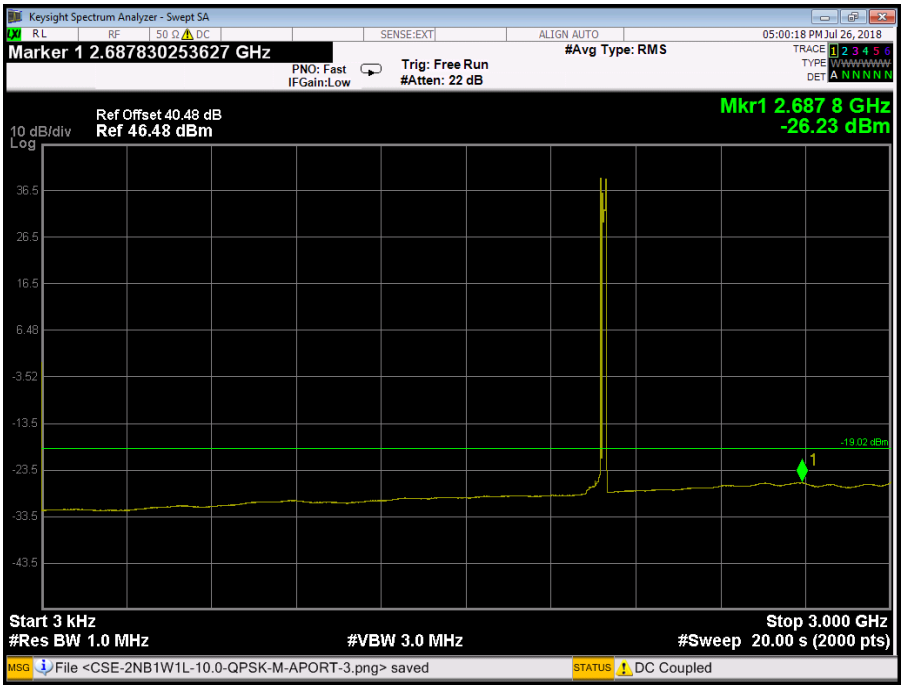
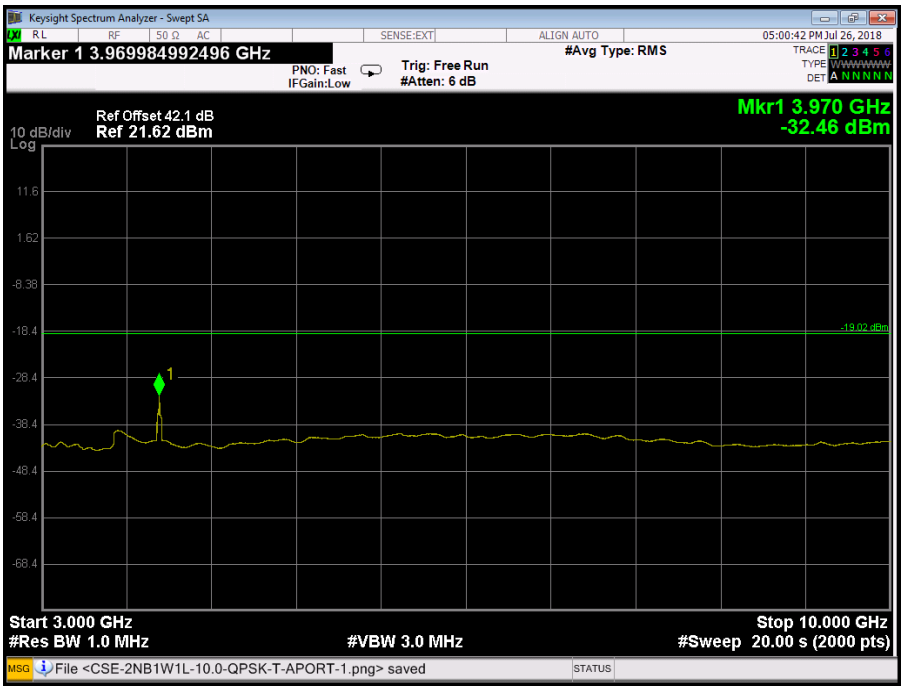
Port A, Channel Position T, LTE 10.0 MHz





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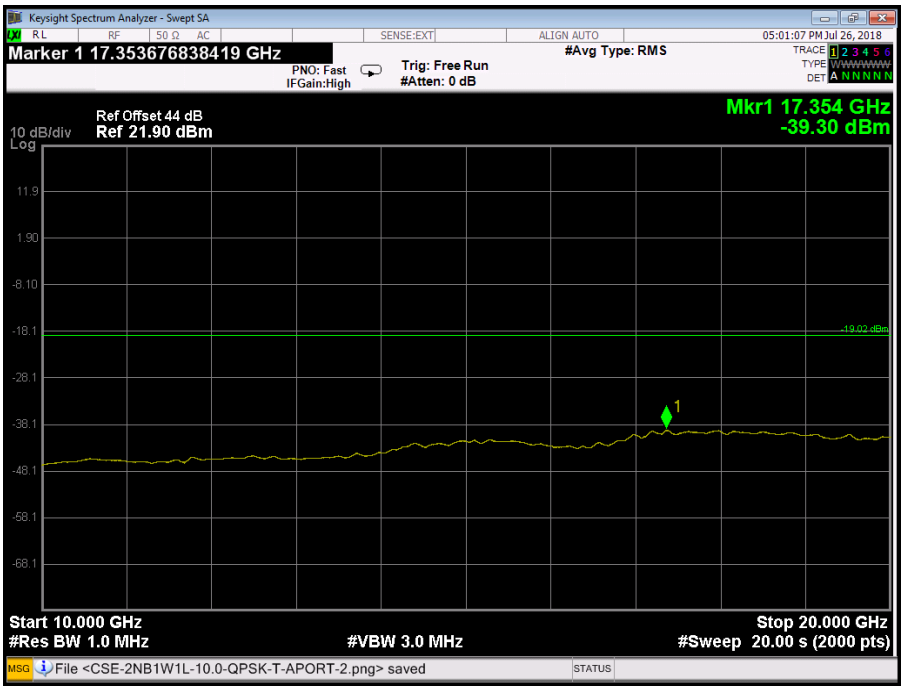
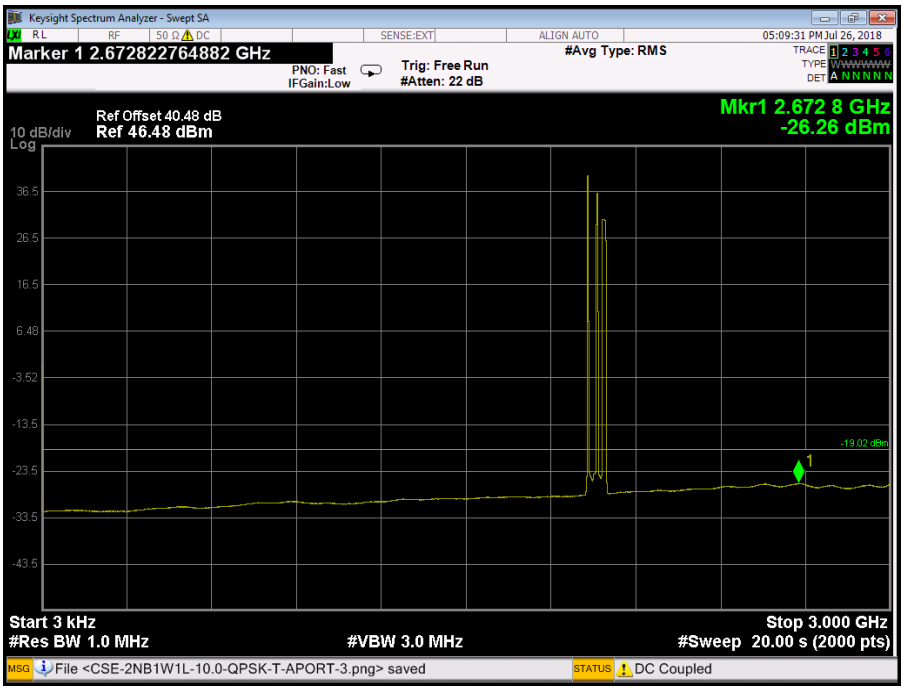


Port A, Channel Position M, LTE 15.0 MHz



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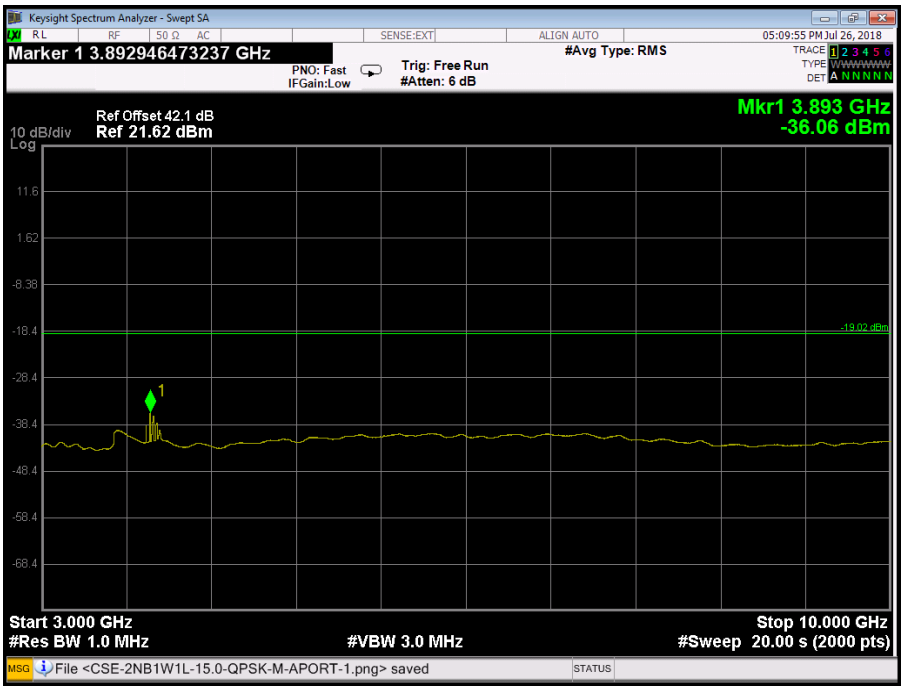

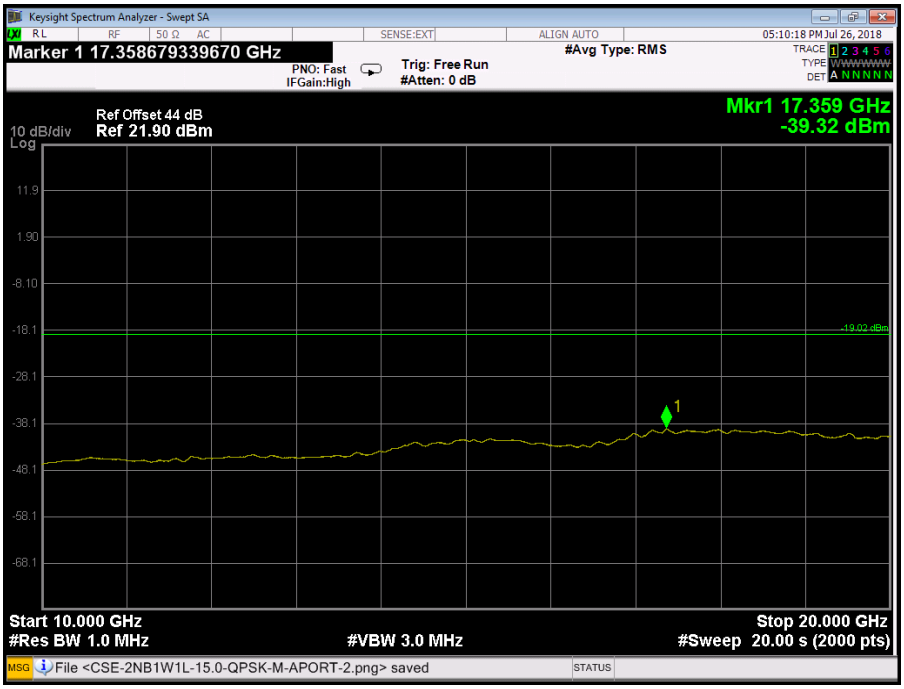

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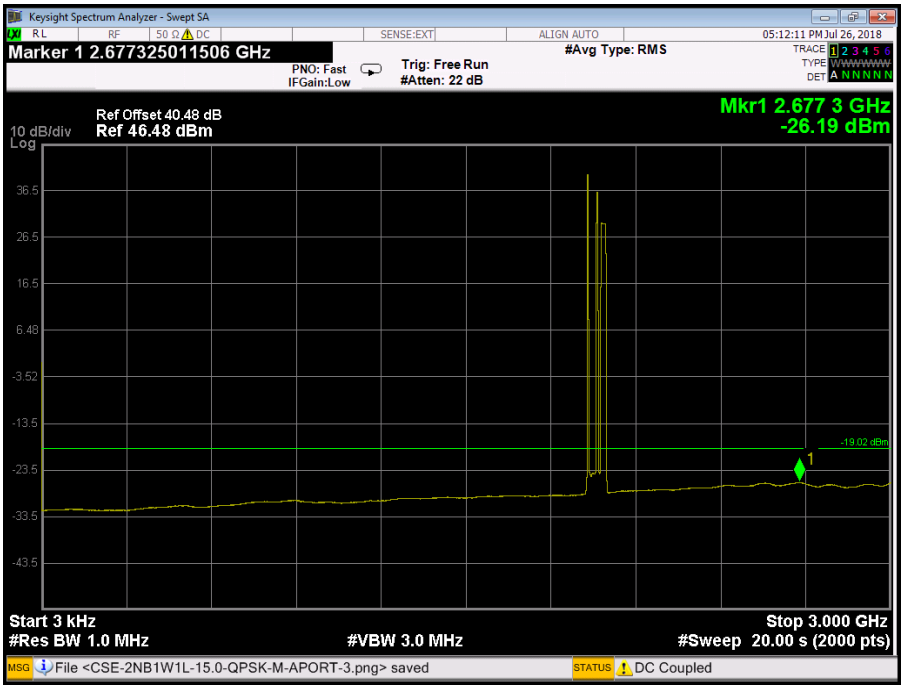
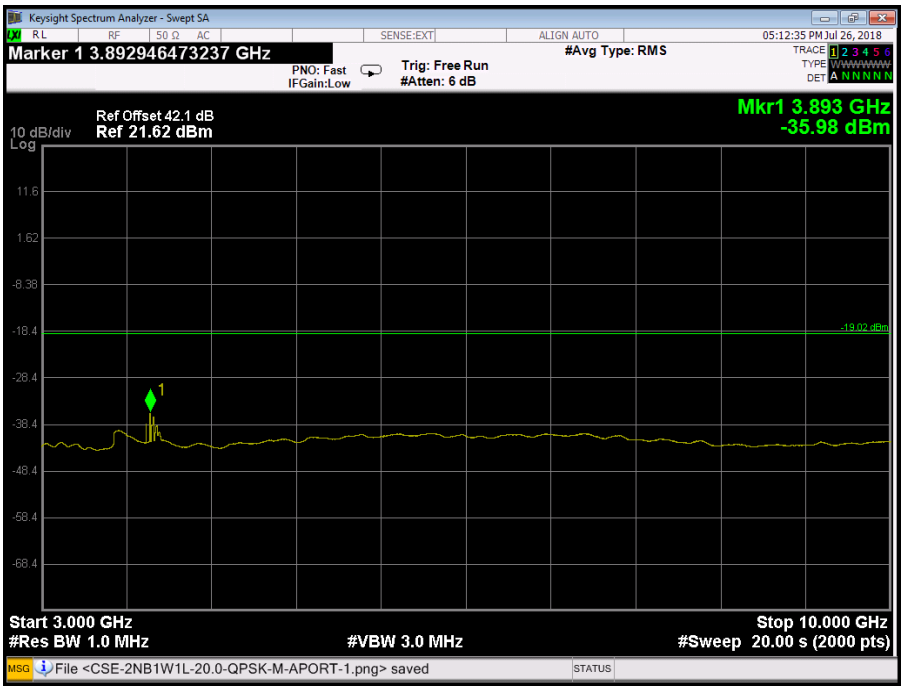
Port A, Channel Position M, LTE 20.0 MHz





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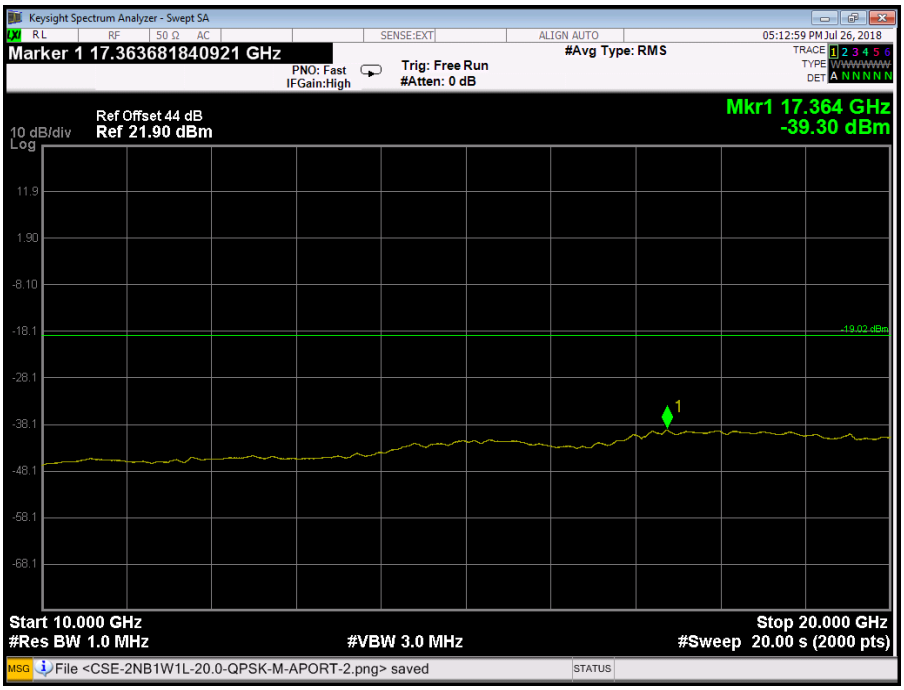
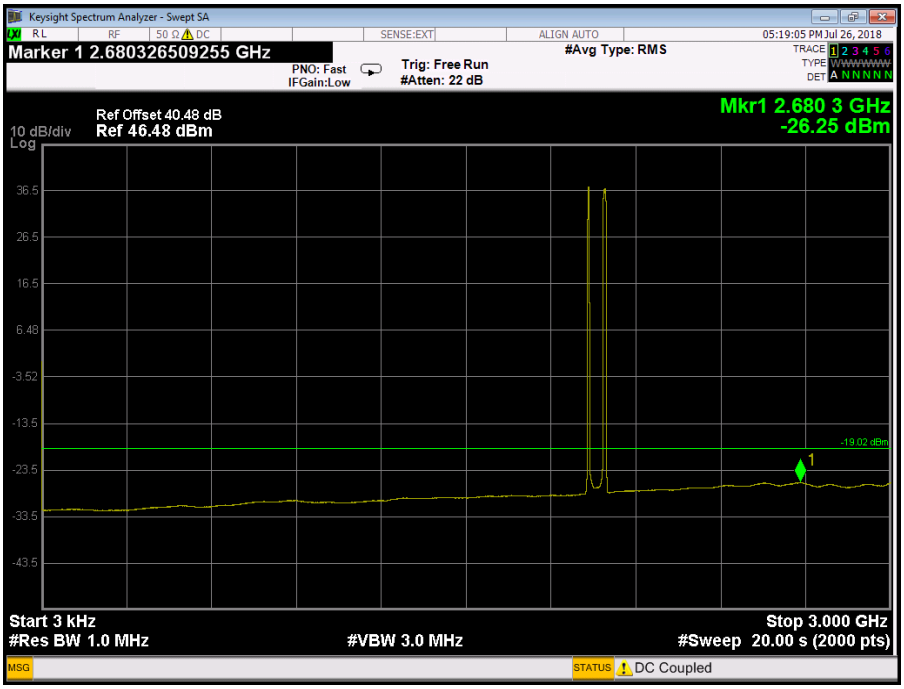


Configuration NB-IoT-IB+GSM+LTE-MIMO-MC-1(1IB QPSK +1WCDMA QPSK +1LTE QPSK)

Channel Bandwidth	RBW (MHz)	Limit (dBm)
IB: 5.0 MHz W: 5.0 MHz L:5.0 MHz	1.0	-19.02

Port A, Channel Position M



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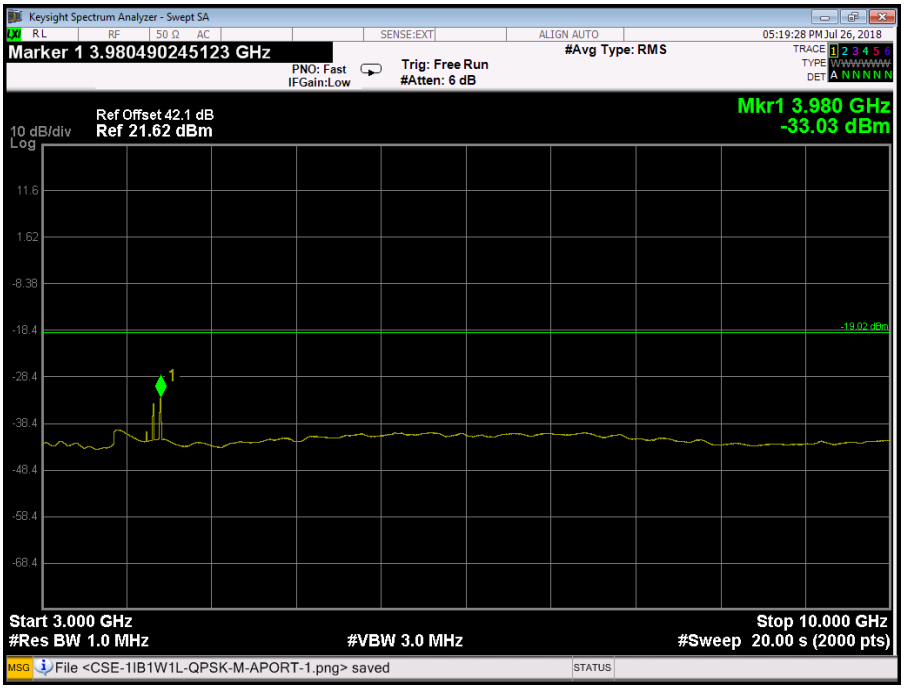

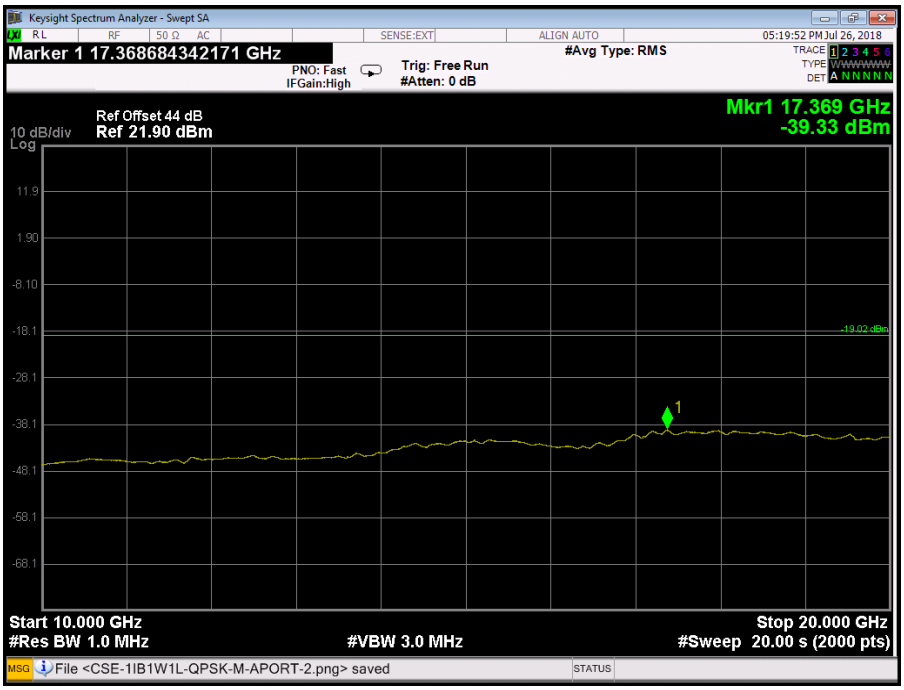

Configuration NB-IoT-IB+WCDMA+LTE-MIMO-MC-2(1IB QPSK +1WCDMA QPSK +4LTE QPSK)

Channel Bandwidth	RBW (MHz)	Limit (dBm)
IB: 5.0 MHz W: 5.0 MHz L:5.0 MHz	1.0	-19.02

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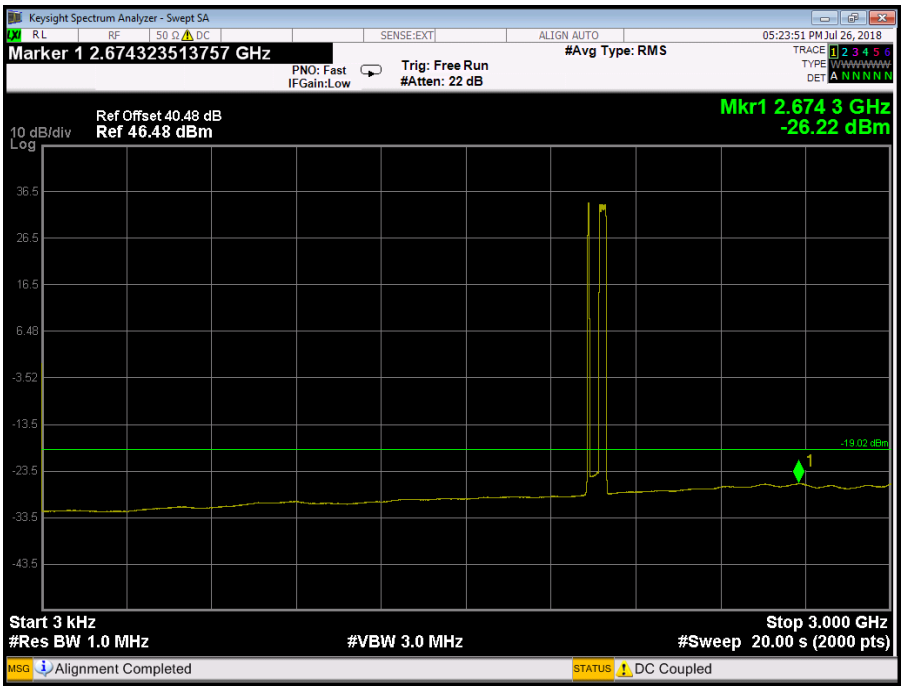
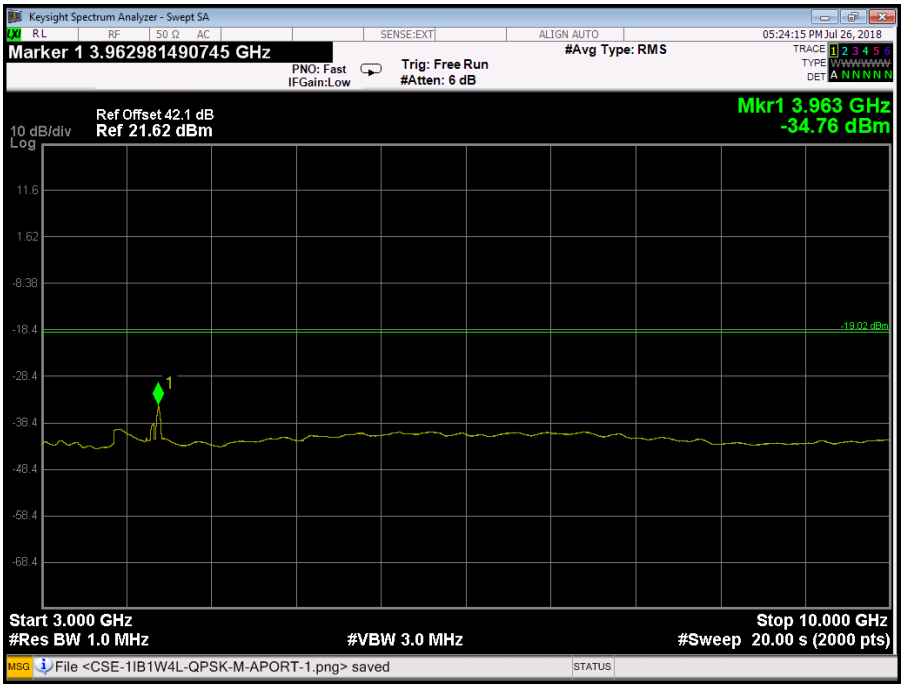
Port A, Channel Position M





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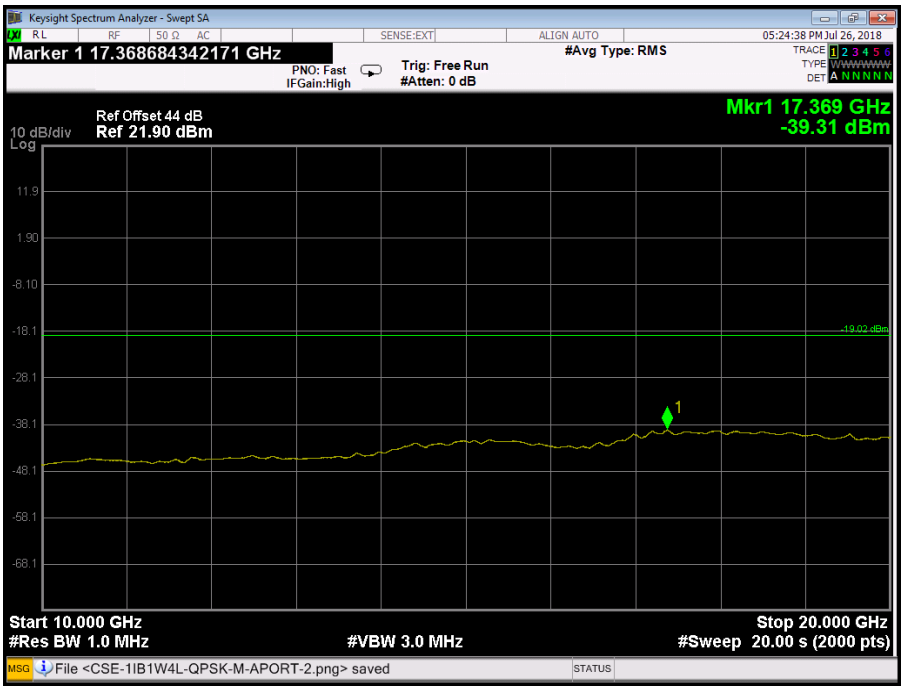

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A.5 Radiated Spurious Emission

A.5.1 Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 24, Clause 24.232 (a) (d)
RSS-133, Clause 6.4

A.5.2Method of measurement

The measurements procedures in TIA-603-E: 2016 are used. This measurement is carried out in semi-anechoic chamber.
A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within the chamber. Measurements of emissions from the EUT were obtained with the measurement antenna in both horizontal and vertical polarizations.
Emissions identified within the range 30MHz to 20GHz were then formally measured using a peak detector as the worst case.
The limits for outside a licensee's frequency band(s) of operation the power of the spurious emissions have been calculated, as shown below using the following formula:

Field Strength of Carrier - (43 + 10Log (P)) dB

Where:

Field Strength is measured in dBμV/m

P is measured Transmitter Power in Watts

The EUT was measured with the antenna height varied between 1 and 4 m with the turn table rotated between 0 and 360 degrees. The emission of any outside a licensee's frequencies within 20dB of the limit were measured with the substitution method used according to the standard.
The measurements were performed at a 3m distance unless otherwise stated.

A.5.3 Measurement limit

The field strength of the carrier has been calculated assuming that the power is to be fed to a half-wave tuned dipoles as per 2.1053 (a).

$E_{(v/m)}=(30 \times G_i \times P_o)^{0.5} / d$

Where

G_i is the antenna gain of ideal half-wave dipoles,

P_o is the power out of the transceiver in W,

d is the measurement distance in meter.

Therefore at 3m measurement distance the field strength using the lowest transceiver output power would be:

$E_{(v/m)}=(30 \times 1.64 \times 16.56)^{0.5} / 3 = 9.51V/m = 139.57 dB\mu V/m$

As per 24.238 (a) the spurious emission must be attenuated by 43 + 10log (Po) dB this gives:
43 + 10log(16.56) = 55.19 dB
Therefore the limit at 3m measurement distance is:
139.57 – 55.19 = 84.4 dBμV/m
These limits have been used to determine Pass or Fail for the harmonics measured and detailed in the following results.

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A.5.4 Measurement results

Configuration NB-IoT-GuardBand-1C **:**

Maximum Output Power 52.0dBm

Channel Position	Channel Frequencies
Channel Position B	1935.0MHz
Channel Position M	1962.5MHz
Channel Position T	1990.0MHz

Channel Position B

No emissions were detected within 20dB of the limit.

Channel Position M

No emissions were detected within 20dB of the limit.

Channel Position T

No emissions were detected within 20dB of the limit.

Configuration NB-IoT+GSM-MC-2:

Maximum Output Power 52.0dBm ,

Channel Position	Channel Frequencies
Channel Position B	(G)1930.4MHz+(NB)1969.2MHz+(NB)1969.8MHz
Channel Position M	(G)1940.2MHz+(NB)1979.2MHz+(NB)1979.8MHz
Channel Position T	(G)1950.2MHz+(NB)1989.2MHz+(NB)1989.8MHz

Channel Position B

No emissions were detected within 20dB of the limit.

Channel Position M

No emissions were detected within 20dB of the limit.

Channel Position T

No emissions were detected within 20dB of the limit.

Configuration NB-IoT+WCDMA-MC-2:

Maximum Output Power 52.0dBm

Channel Position	Channel Frequencies
Channel Position M	(NB)1952.7MHz+(W)1962.4MHz+(NB)1972.3MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration NB-IoT+LTE-MIMO-MC-2 **:**

Maximum Output Power 52.0dBm

Channel Position	Channel Frequencies
Channel Position M	(NB)1952.7MHz+(L)1962.5MHz+(NB)1972.3MHz

Channel Position M

No emissions were detected within 20dB of the limit.

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Configuration NB-IoT+LTE-MIMO-MC-3:

Maximum Output Power 52.0dBm

Channel Position	Channel Frequencies
Channel Position M	(NB)1952.7MHz+(NB)1972.3MHz +(L)1958MHz+1961MHz+1964MHz+1967MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration NB-IoT+GSM+WCDMA-MC-3 :

Maximum Output Power 52.0Bm

Channel Position	Channel Frequencies
Channel Position M	(NB)1979.2MHz+1979.8MHz +(W)1957.4MHz+1962.4MHz +(L)1979.2MHz+1979.8MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration NB-IoT+GSM+LTE-MIMO-MC-2:

Maximum Output Power 52.0Bm

Channel Position	Channel Frequencies
Channel Position M	(NB)1979.2MHz+1979.8MHz +(G)1940.2MHz+(L)1960MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration NB-IoT+WCDMA+LTE-MIMO-MC-2**:**

Maximum Output Power 52.0m

Channel Position	Channel Frequencies
Channel Position M	(NB)1930.3MHz+1930.9MHz +(W)1962.4MHz (L)1985MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration NB-IoT-GB+LTE- MIMO-MC-1:

Maximum Output Power 49.0Bm

Channel Position	Channel Frequencies
Channel Position M	(L)1990MHz+ (GB)1935MHz

Channel Position M

No emissions were detected within 20dB of the limit.

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Configuration NB-IoT-IB+LTE- MIMO-MC-1 :

Maximum Output Power 49.0m

Channel Position	Channel Frequencies
Channel Position M	(L)1992.5MHz+ (IB)1932.5MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration NB-IoT-IB+WCDMA+LTE-MIMO-MC-1:

Maximum Output Power 49.0m

Channel Position	Channel Frequencies
Channel Position M	(W)1932.4MHz+(L)1987.5MHz+ (IB)1992.5MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration NB-IoT+GSM+LTE-MIMO-MC-3:

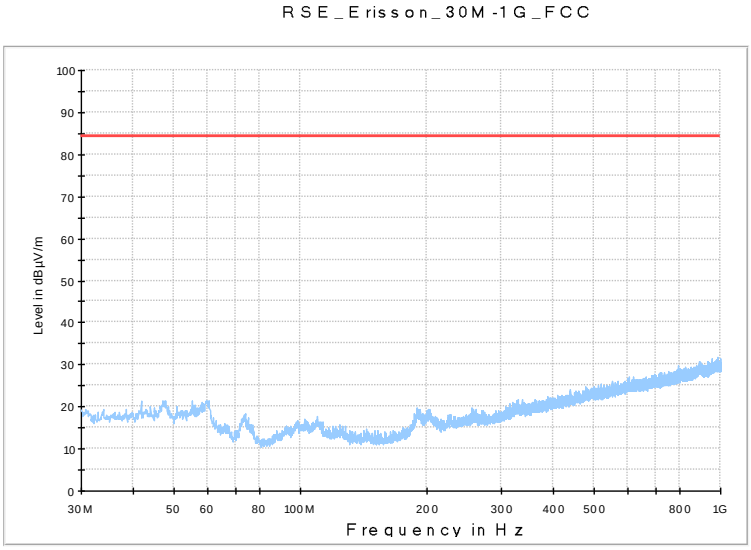
Maximum Output Power 52.0m

Channel Position	Channel Frequencies
Channel Position M	(NB)1979.2MHz+1979.8MHz +(G)1940.2MHz+1940.8MHz (L)1959.3MHz+1960.7MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Channel Position M–30MHz-1GHz



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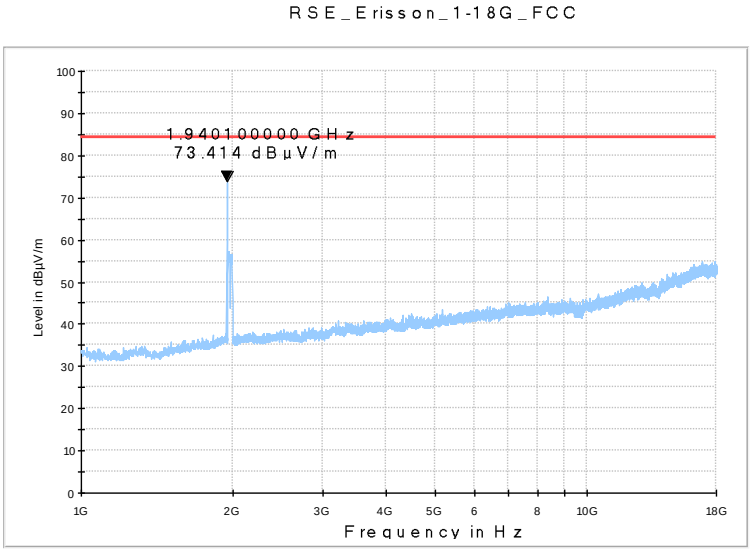
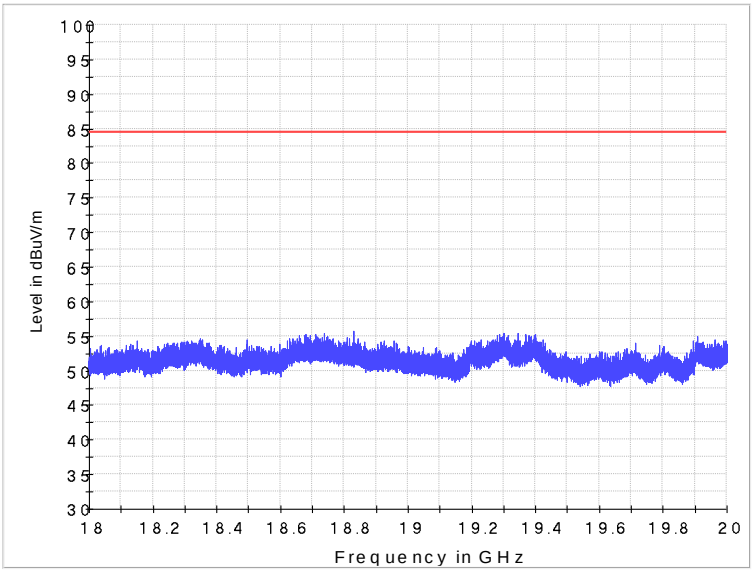
Channel Position M–1GHz-18GHz



Channel Position M-18GHz-20GHz



Remarks

The EUT does not exceed -13dBm / 84.4dBµV/m at the measured frequencies.

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A.6 Frequency Stability

A.6.1 Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 24, Clause 24.235
RSS-133, Clause 6.3

A.6.2 Method of measurement

Temperature Variation

The EUT was tested over the temperature range -30°C to +50°C in 10°C steps with -48 VDC Power Supply. At each temperature step, the Base Station was configured to transmit an[RAT]* at maximum power on the middle channel of the operating band. After achieving thermal balance, the averages of 200 transmission bursts were measured and the result recorded.

Voltage Variation

The EUT was tested at the supplied voltages varied from 85 to 115 percent of the nominal values of -48 VDC. At +20°C, the Base Station was configured to transmit an [RAT]* at maximum power on the bottom, middle and top channel of the operating band. The average of200 transmission bursts was measured and the result recorded.

[RAT]*:
NB-IoT - QPSK modulation

A.6.3 Measurement limit

FCC: The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized frequency block.
ISED: ±1.0 ppm

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A.6.4 Measurement results

Frequency Error – Temperature Variation

Configuration NB-IoT-GuardBand-1C

Maximum Output Power 49.03dBm per port, Channel Bandwidth 10MHz

Supply Voltage DC(V)	Temperature	Frequency Stability (Hz)		
		Channel position B	Channel position M	Channel position T
-48	-30	1.25	1.38	-1.11
	-20	1.24	-1.27	1.81
	-10	1.32	-1.30	-1.32
	0	1.27	-1.67	-1.69
	10	-1.64	-1.63	-1.23
	20	1.21	-1.05	1.19
	30	-1.52	1.35	-1.91
	40	1.73	1.60	-1.09
	50	-1.85	-1.34	1.24

Frequency Error – Voltage Variation

Configuration NB-IoT-GuardBand-1C

Maximum Output Power 49.03dBm per port, Channel Bandwidth 10MHz

Supply Voltage DC(V)	Temperature(°C)	Frequency Stability (Hz)		
		Channel position B	Channel position M	Channel position T
-40.8	20	-1.38	1.85	-2.01
-48	20	-2.46	1.05	-1.57
-55.2	20	1.02	-1.20	-1.11

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ANNEX B: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 600118-0

Telecommunication Technology Labs, CAICT
Beijing
China

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2017-08-22 through 2018-09-30
Effective Dates

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA

For the National Voluntary Laboratory Accreditation Program

*****END OF REPORT*****

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